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A TREATISE

ON THE

PRINCIPLES AND PRACTICE

OF

PHYSIO-MEDICAL SURGERY;

FOR THE

USE OF STUDENTS AND PRACTITIONERS.

BY WM. H. COOK, M. D.,

PROFESSOR OF THERAPEUTICS AND MATERIA MEDICA IN THE PHYSIO-MEDICAL COLLEGE OF OHIO;
LATE PROFESSOR OF SURGERY IN THE SAME INSTITUTION.

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TO

Alva Curtis, A. M., M. D.,

PROFESSOR OF THE INSTITUTES AND PRACTICE OF MEDICINE IN THE PHYSIO-MEDICAL COLLEGE OF OHIO,

DISTINGUISHED ALIKE FOR THE AMIABLE QUALITIES OF HIS HEART,

THE EXTENSIVE ACQUIREMENTS OF HIS MIND

AND THE

STRENGTH OF HIS DEVOTION TO THE CAUSE OF MEDICAL REFORM,

THIS VOLUME

IS RESPECTFULLY DEDICATED AS A TOKEN OF THE ESTEEM IN WHICH HE

IS HELD BY HIS FRIEND AND COLLEAGUE,

THE AUTHOR.

ERRATA.

A NUMBER of typographical errors will be found through the pages of this volume. Some of them are very trifling, others give a technical impropriety to words, while a few throw an ungrammatical construction on the sentences in which they occur. They are all very palpable, however, and not likely to mislead the student; on which account it is deemed proper to make this general explanation, rather than to be critically tedious in giving tables of that which is in itself sufficiently plain.

PREFACE

If the use of instruments constituted the sum total of surgical science, there would not have been any occasion for the appearance of this volume; for the labors of both American and European surgeons have carried this department of practice to a point of excellence beyond which it seems scarcely possible to advance. The skill of Liston, Fergusson, Miller and Erichsen, in Great Britain; of Malgaigne, Civiale and Velpeau, in France; and of Gibson, Pancoast, Barton, Mott, Carnachan and Mussey, in America, has left little to wish for in this respect.

It is universally admitted, however, that mere mechanical expertness forms but a small portion of the acquirements that should belong to the finished surgeon. Without this expertness, he cannot lay any claim to the honors of an operator; but, possessing this only, he sinks to the minor position of an ostentatious brandisher of tools. For the legitimate object of a surgical operation is to remove members from the body only after it has become evident that their further connection with the frame jeopardizes the life of the patient; and as familiarity with the laws of the animal economy is imperative when the practitioner would decide upon the propriety of calling instruments to his aid, so an acquaintance with the virtues of sanative agents is required both to save limbs from rash mutilation and to fit patients to endure an operation after one has become necessary. It follows, therefore, that he who has the clearest understanding of life, disease and death; who is best prepared to judge of the resisting capacity of the one and the disintegrating advances of the others; and who possesses those means which are best calculated to check the progress of decay and render assistance to the recuperative efforts of nature, is also best qualified to fulfill the high calling of a surgeon. It is in these respects that the Physio-Medicalist has the advantage over all other practitioners, to define which advantage is the chief object of the present treatise.

The distinguishing features of Physio-Medical Surgery may be said to lie in these three points: 1st. That irritation, inflammation and fever, are purely vital demonstrations, opposing the encroachments of disease and never directly favoring the advance of death. 2d. That congestion, suppuration, ulceration and gangrene, are processes of destruction, existing only when the life principle has lost its control over the tissues and the resolving power of chemical laws has usurped its place. 3rd. That no agent can be directly serviceable in the treatment of disease, unless it is essentially innocent in its qualities. These propositions lie at the very foundation of all surgical practice. It does not answer the purposes of truth to sneer at them as novelties, jilt them as speculations nor thrust them aside as verbal exactions. They are either wholly correct or totally false; and he who would pass them by without either establishing or refuting them, is rashly anxious to rush upon unknown ground. The Physio-Medicalist has the enviable satisfaction of knowing that his distinctive principles are in harmony with every fact in nature, that they are applicable to the minutest requirements of a bed-side practice, that they have stood the closest scrutiny for a period of seventy years and that they have saved thousands of limbs and thousands of lives that had otherwise been beyond the reach of human art.

These considerations form a sufficient apology for the appearance of the present volume. There was something new to offer—something entirely different from the established opinions and practices of surgeons and of sufficient importance to deserve a careful consideration. The labor of presenting these views was undertaken for the purpose of furnishing a guide to the student and practitioner, at the same time that the practical value of the tenets is respectfully offered for the consideration of the more erudite in the profession. As no book can supply a surgeon with mechanical skill, the descriptions of the several operations have been intentionally limited; and as unsettled questions are never helped to a solution by dogmatic pedantry, it has been deemed better and more just to confess a want of light where it was felt, than to attempt to establish a theory that had only plausibility to recommend it. The words of other authors have been many times quoted, especially where their clearness and correctness left little to hope for by way of amendment. In all such cases, due credit has been given for the selection; and no failure to return honor to whom it was due has been intentionally overlooked. Many excellent suggestions have been offered by various friends, especially by Prof. A. Curtis and Dr. Z. Hussey, for which I take pleasure in thus publicly acknowledging my indebtedness—sending forth the volume with a keen sense of its imperfections, but hopefully intrusting it to the leniency of a generous profession.

WM. H. COOK.

Cincinnati, August 15th, 1857.

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PHYSIO-MEDICAL SURGERY.

PART I.

VITAL MANIFESTATIONS OF DISEASE.

CHAPTER I.

MANIFESTATIONS THROUGH THE NERVOUS SYSTEM.

Irritation.

All parts of the body are united in a close relationship by means of the nervous system—a system which links the internal centers to the remote peripheries and serves as a medium for conveying the vital principle through every tissue and structure of the organism. It is the channel through which all impressions are received; it takes cognizance of all that is pleasurable and all that is painful—and thus becomes a medium of enjoyment, of suffering and of security, by rallying the conservative power of the system to resist invasion. To the surgeon, the offices and capacities of the nervous structures are of great importance; for not an injury can be suffered, nor an operation performed, without affecting the filaments that feel: and, should they be already morbidly sensitive, or suffering from the presence of corrosive materials, most troublesome constitutional disturbances may ensue. Our first thoughts, therefore, are most properly directed to the irregularities manifested through the sensory system.

The prominent function of the nerves, or at least that division of the nervous functions with which we have to deal at present, is *sensibility*. By this is simply understood the faculty of receiving impressions under the ordinary circumstances of health. When sensibility becomes exalted to a high degree, it constitutes *irritability;* and when it is persistently and unpleasantly excited, it becomes *irritation*. Irritation is always more or less painful: but severe pain may be caused by any impression that disturbs the balance of nervo-vital action suddenly and to a great degree. Repeated shocks of a painful nature may give rise to irritation, and, by being long continued, may destroy all vital action. The abuse of naturally pleasurable impressions also results in morbid sensibility. Pain and irritation may be confined to that part of the nervous system directly impressed, or may extend to the whole of it. They may have their connection with the nervous peripheries and either remain circumscribed or extend toward the nervous centers; or they may commence at the centers and extend outwardly; or have their origin in a ganglion or along the course of a large nerve and spread toward the circumference; or, whether the excitation exists in a nervous trunk or a nervous extremity, the sensation may be carried to the spinal centers and thence reflected so as to be felt at a portion of the system quite remote from the point at which the difficulty really exists. Thus, friction upon the surface will shortly increase the sensibility to such an extent, that the part will feel tender and painful—when it is said to be irritated. If the friction is continued, the parts will become so excited that the impression will be carried to the nervous centers and a general feeling of uneasiness, and even of pain, will be perceived. Tic douloureux, cardialgia and other forms of pure neuralgia, are illustrations of irritation of the nervous centers coursing toward the circumference, and of irritation of nervous ganglia extending itself in the same manner. The pain at the shoulder in some affections of the liver, and the excitement of the mammæ in conjunction with uterine irritation (with or without concurring gestation), are familiar instances of a reflection of increased sensibility.

As all portions of the system are, more or less completely, dependent upon the presence of healthy nervous structures as a medium for the conveyance of vital power to them, it will be at once understood that pain and irritation, whether local or general, will lead to more or less marked aberrations of function, depending upon the structure and function of the part irritated. A very slight elevation of susceptibility excites to a corresponding degree of functional elevation: as, an increased flow of gastric juice upon the introduction of food to the stomach, a slight contraction of the iris upon directing the eye to a stronger ray of light, a keener flow of ideas upon the use of an agent which arouses the cerebral activity, a strong desire for motion upon increasing the circulation of blood through the muscles, &c. The food, the light and the active circulation, are so many stimulants to the nervous structures, arousing their capacity to feel and sustaining their ability to act, and, therefore, leading to the increase of functional capacity or power. If these same stimulants are introduced and applied in greater quantities and for a greater length of time, the elevated sensations, which were before pleasurable, now become painful and the feelings are those of decided uneasiness: the stomach will continue its efforts to secrete gastric juice, the iris will contract more, the mind will be wakeful with excitement, and the muscles suffer from excited nervous vibrations. Let the stimulants be still further continued, or others more harsh in character employed, and the former sensations of uneasiness will shortly increase to a tenderness and then to decided pain, or, it may be, stupor; the excited stomach will loathe its contents, perhaps eject them; the eye will seek protection by closing the conjunctiva: the mind will wander with delirium, and the muscles may be excited to convulsions. These irregularities afford conclusive evidence that the vital principle has been subjected to embarrassments and labors exhausting to the system, by the introduction of either a superabundance of materials, or of stimulants producing irritation. And, as all structures have a limit to their capacity (the nervous not excepted), injury can scarcely fail to result from such circumstances, and the consequences may be disastrous.

The universal observation that irritated parts become exhausted and incapable of strong physiological action, has led to the conclusion that pain was a disease. Pain is, in itself, truly undesirable; yet its existence is but an evidence of injury being inflicted upon a part, and the increase of sensibility is the direct means of exciting an increase of vital action. Irritation, therefore, is a most faithful sentinel to this clayey tenement of life—always noting the existence of danger, giving warning of invasions being made upon the organized domain of vitality and arousing the life power to a vigorous resistance to all such foreign encroachments. The system may not always be able to remove the obstructions, overcome the offending causes, and restore the impaired structures to a perfectly healthy condition: but if, after a vigorous struggle to accomplish these ends, the vital principle is at last under the necessity of giving way to chemical power, it does not alter the essentially useful tendency of that irritation which first gave notice of the threatened disruption. Yet, while we discard the idea that pain and irritation are in themselves diseases, we must not, therefore, conclude that they are, or should be present in a state of well balanced health. While the capacity to suffer pain, to be irritated and aroused into a vigorous fever, must ever exist in the healthy body, and are all evidences of effort to preserve life and befriend the objects of medication, they also indicate that the frame has wandered from the natural way and admonish against the inactivity of a false security.

Physiology teaches us that the action of every organ and tissue of the animal economy is dependent upon the influence of the vital force, and that every functional exertion is but an evidence that this force is using those organs and tissues for a given end. Sensation, therefore, being a functional capacity of certain of the nervous structures, the manifestations of that capacity come entirely from the control exerted over those structures by the life principle. A muscle cannot contract, nor an artery impel blood, nor a liver secrete bile, nor a nerve feel impressions, if the vital force has left the frame. This is a physiological axiom, and from it is deduced the important principle, that *every* muscular contraction, arterial impulse, hepatic elimination and nervous susceptibility, are but so many manifestations of the vital force. Irritation, therefore, is not to be looked upon as disease, nor any integral part of disease, but simply as a vital, functional, physiological evidence of injury being done to the system.

The correctness of these conclusions will be further seen upon a few moments reflection, and an examination of some of the more common circumstances under which pain occurs. Thus, with the fingers and thumb, we pinch the skin upon our arm, and pain is felt. The nerve recognizes the injury being inflicted, and, in its own dumb way, cries out against the violence. It will only take a moment to determine whether the pain constitutes the mischief, or whether the difficulty consists in the pressure made upon the nervous peripheries. Or, let the case be one of incision made by a sharp scalpel. Is the pain then suffered a diseased action? or is it a living, vital witness of the outrage done to the integuments by the knife? Or, again, pour undiluted sulphuric acid upon the skin. The structures are chemically corroded, and the parts underneath the ones thus disorganized are extremely sensitive—highly irritated. Why? Evidently for the purpose of signifying, to the body at large, that the parts had suffered spoliation. The danger did not consist in the recognition of the presence of the acid by the nerves, but in the outrage done to the living tissues by the application of the chemical destroyer. And this recognition (irritation, pain) is of the greatest importance in a remedial point of view; for the injuries and abrasions can only be remedied by an increased flow of blood to the seat of loss, and this flow can only be secured through the stimulation (increased sensation) of the nerves. In proportion as the nerves lose their vital capacity and become unable to respond to the deleterious impressions, or herald the extent and character of the devastations, in exact proportion will the parts be liable to further decay: and if the injury is of such kind and degree as to completely destroy all power of feeling, the chemical disorganization of all those portions is inevitable.

The exhaustion and feebleness, consequent upon intense pain and long continued irritation, form no evidence that these elevations of sensation constitute disease. Any tissue or organ will be exhausted by excess of functional activity: as, the brain by over-thinking, the muscles by over-walking, the stomach by over-eating, &c. In the present instance, the irritated parts became worn and fatigued because of their efforts to resist invasion (in whatever form it may have been presented to the nervous structures); the invasion being the provoking cause of the extreme sensation, and hence, of course, the only difficulty to be feared. Irritants demand removal, because of their liability to thus injure the tissues. If it be asked why the nerves do not *continue* their resistance, seeing it is of such importance in the preservation of the body? why does the function of sensation ever leave the tissues of the body at the mercy of the exciting causes of irritation? it would, in turn, be proper to inquire, why does a structure become feeble when it is worked more rapidly than it is nourished? why has nature placed a limit to the capacity of the animal organism? The exertion which fatigues a structure should by no means be classed as a disease; but the circumstances which made a necessity for such an exertion should be counted as the whole mischief, without the existence of which the system would not have been in any danger.

CAUSES.—The remote or provoking causes of irritation may be included in a single sentence, namely, the presence of agents which excite nervous susceptibility. The kind, quality and source of those agents are very various. Thus, they may be solid or fluid; mineral, vegetable or animal; mild, harsh or very severe; of external origin or internal production, &c. Professor Miller (Principles of Surgery, p. 90) instances the following familiar examples: "Rubbing of the surface produces irritation of the part rubbed; stone in the bladder produces irritation both directly and indirectly—in the vesical coat with which it is in contact, and also referred to the mucous membrane of the orifice of the urethra; foreign matter lodged in the kidneys acts in the same way." So, Spanish flies, powdered glass, fecal accumulations, retained sweat, gonorrheal discharge, pus, uneliminated bile or urine, virus of syphilis and gonorrhea, and numerous other articles, may be provoking causes of irritation. Some of these excite a very small portion of the system, others are likely to prove excitants to a more considerable portion, and some (floating through the circulation) prove irritants to the body as a whole.

REMEDIAL MEASURES.—There are two ways, and only two, in which a part can be influenced so as to cease being painful, namely: 1st, by destroying the ability of the nerves to feel the influence of irritating (pain provoking) causes; 2d, by removing those causes, either mechanically or by putting the tissues in such a condition that they can themselves both resist and remove them. We will consider the relative value of these two modes.

The first of these methods is incorrect, not promoting a curative process. It is the *Narcotizing* plan, the practice consisting in the exhibition or application of opium, henbane, aconite, foxglove, nightshade, and similar articles. Such agents more or less promptly and completely deaden nervous sensibility; or, as Dunglison expresses it in his Lexicon, produce "a state of more or less profound stupor." When a part or the whole of the system is under the influence of such agents, it has lost its ability to respond promptly to the natural impressions of food, drink, air, light, &c.; and if their exhibition is continued, death will be the result. Their employment, therefore, is a practical nullification of the great principle upon which the healing art is founded, namely, a humanitarian desire to save life.

The practice of narcotization rests upon two propositions: 1st, that narcotic agents relieve pain, 2d, that irritation is a disease, instead of a sign or symptom of disease, and demands removal by destruction. The first of these propositions should cease to have any weight, for the *manner* in which those agents relieve pain is certainly enough to condemn them forever. The second becomes of no consequence in view of the great truth that irritation is *not* a disease, but merely an exaltation of a physiological function, in consequence of the existence of disease-causing influences or circumstances. To destroy the function is to destroy the vitality of the nerves, upon which the integrity of the whole body depends. It is simply exposing the system to spoliation by exterminating the faithful sentinels which stand ready to give timely warning of every threatening danger.

But narcotics do not always succeed in accomplishing even this result; for their nature renders them so foreign to the human frame, that they stand in the light of offending materials and often provoke an irritation much more violent and unmanageable than that for which they were given.

Seeing, then, that the narcotizing mode of treating irritation is philosophically incorrect, and that the relief obtained by narcotic agents is the relief of death, we are compelled to reject this plan in its every mode of application, and to wholly exclude all such agents from the table of our remedial means.

This brings us to a consideration of the *second* mode of treating irritation, namely, by removing the pain provocatives, either mechanically or by putting the tissues in such a condition that they can themselves both resist and remove them. The first of these methods (the mechanical) is practiced in all cases where the difficulty consists in the introduction of foreign solids (as wood, iron, steel, &c.), or where internal local accumulations give occasion for the exalted sensibility (as in the cases of boils, carbuncles and abscesses). It is apparent that the removal of spiculæ, the discharge of pus, and the dislodging of hard feces, are the first things to be done with a view of obtaining relief in such cases, and, when the constitution is robust and the injury done to the tissues is not extensive, this is likely to be all the assistance needed. Where pain has been provoked by circumstances and influences that cannot be removed by these means, or where the tissues have been mechanically injured to such an extent that the mere removal of the solid substances is not sufficient to restore the tissues to their normal degree of feeling, the wounded parts are protected from the atmosphere, and then the medicinal method of treatment is adopted. This consists essentially in *relaxation*—the structures being so influenced as to yield their rigidity and become soft, pliant and open. In view of the premises, we at once perceive that that course of management which loosens the tissues and makes a way of escape for the irritating materials, will be the most effectual for the removal of pain.

Relaxation alone, however, is not always sufficient, but mild stimulants are often needed in addition. This is particularly the case when the tissues have become exhausted by the continuance of the excitation, or when irritation has been recently provoked in structures that are already greatly enfeebled. Under these circumstances, the organism needs to be aided in its endeavors to resist and expel the irritating agents or conditions: not aided by being excited to more irritation, but assisted by being sustained in its acting capacity. This aid is rendered by the use of stimulants, it being remembered, however, that the stimulation must *always* be combined with relaxation, the relaxants being generally in excessive proportion. The pure, permanent stimulants are seldom needed, and for this reason it is best for the practitioner to make selection of those agents which are but moderately stimulating and at the same time combine relaxing qualities.

The more purely relaxing agents are, lobelia inflata, vapor, tepid or warm water, mentha viridis, nepeta cataria, galium aparine, and macrotrys racemosa. Of those that combine both stimulating and relaxing qualities, the more diffusive are asarum canadense, polemonium reptans, aralia racemosa, and zinziber; the more permanent are cypripedium, scutellaria lateriflora, panax quinquefolium, arctium lappa, liriodendron tulipifera, and alnus serrulata. These agents may be employed locally or generally; as a wash, a fomentation or a poultice; by infusion, decoction or sirup—singly or combined, to suit the necessities of individual cases. The more diffusive agents, and the most diffusive mode of exhibition, are usually selected for acute cases; while the more permanent agents, and the more permanent modes of exhibition, are commonly employed in chronic cases. In this matter, however, separate cases must be allowed to dictate the articles employed and the mode and quantity of their administration—one rule only being constantly borne in mind, namely, having selected an appropriate agent or agents, continue to give them till the desired ends (expulsion of the provocatives and relief from pain) are secured.

Local Irritation.

SYMPTOMS.—When a circumscribed portion of the system is irritated, the sensibility is at once increased—sometimes only to an itching and a slight tenderness, at others to actual pain, and occasionally it rises to the most intense agony. The suffering usually commences quite suddenly, and remains at a fixed degree unto the end, being more or less remittent, and sometimes even perfectly intermittent. If the nervous peripheries thus excited are directly connected with the circulatory apparatus, a flow of blood toward the part is an immediate result; an increase of redness and heat are then observable, the engorgement causes more or less tumefaction, and the sensibility is still further increased by the stimulus of the arterial flow. This is the most common result of local irritation, and it has passed into a medical proverb, that, *ubi irritatio, ibi fluxus*—where there is irritation, there is an afflux of blood. Many authors, in treating of irritation, will not admit that it is proper to connect it with this increased determination of fluids to the part, but would rather treat it altogether under the head of Inflammation. When, however, we have properly settled our minds upon the essential character of irritation, we will perceive that inflammation cannot be established without this increase of sensation; hence it is imperative to consider it among the observant sequences of irritation. Instances of this character are found when ascarides are lodged in the rectum, or calculi in the bladder; also in the pain and inflammatory action which follow the introduction of any foreign solid into the integuments, or the application of an undiluted mineral acid to a tissue. But if those nervous peripheries which are not connected with the circulatory apparatus are irritated, no special increase of heat, redness or size, will be observed. A livid hue may be presented in consequence of stagnation of the blood in the parts, or the parts may present a pale and anæmic appearance, especially if the irritation is upon, or in the course of, some intermuscular nerve. Tic douloureux is the most familiar example of irritation under these circumstances. These appearances, however, may be, in a measure, reversed during the continuance of irritation. Thus, protracted excitement of the nerves supplying blood vessels may so exhaust them that they will be unable to keep up an active circulation, when the red appearance will be exchanged for a livid hue, and this ultimately disappear, to a great extent, and leave the parts comparatively pale, yet with a sensibility even more pungent than what existed before. Or, the free nerves may be rendered acutely sensitive, and the irritation proceed from them, either directly or by reflection, to the nerves of circulation, when the previously anæmic appearance will give way to redness and tumefaction. The practitioner should not, therefore, be disappointed at not finding a continuing sameness in every case of irritation that comes under his observation, but must be prepared to witness, understand and properly meet, the above mentioned variations. Success in the treatment of certain forms of disease (as ulceration) depends very much upon the correctness with which these changes are appreciated.

TREATMENT.—Local irritation is chiefly treated by local applications. If the case is an acute one, and the pain intense, poultices of lobelia herb and the powdered ulmus fulva, or cloths wrung from hot water, should be applied and changed frequently. These keep the parts moist, warm and relaxed. At the same time, relaxing doses of lobelia should be given internally. If the case is an open sore, a layer of goose oil, oleum olivæ, or other light lubricant, may be spread upon the surface of the poultice, or upon the sore itself before putting the poultice on. If the irritation has continued for a length of time, the tissues beginning to appear pale and flabby, or of a livid or leaden hue from congestion, a minor quantity of the stimulating relaxants, such as ginger and asarum, should be added to the above poultices. If the congestion is very great, or the anæmic condition quite marked, stronger and more permanent stimulants should be used in small quantities, as capsicum and hydrastis canadensis, and this even when the accompanying irritation is considerable. Poultices may be alternated with the local application of vapor, a very mild degree of heat being employed in acute cases where relaxation alone is needed, and a greater heat when stimulation is needed with the relaxation, or when the irritation is upon some deep seated organ, over which the vapor is applied. Where decided stimulation is needed, absinthium, marrubium, juniperus, leaves of abies canadensis, and similar aromatic stimulants, may be used in small quantities to medicate the local vapor baths. These modes, of course, are to be varied or combined according to the peculiarities of individual cases; but, as this chapter is only intended to embrace the *principles* of managing irritation, the student will find the particulars concerning the application of these principles under the heads of Suppuration, Ulceration, Inflammation, Burns, &c.

Local medication, however, is by no means the only method of treating irritation. We are to keep constantly before us the great intimacy that exists between all portions of the animal economy, an intimacy always recognized, but becoming doubly apparent in cases of this kind. There are occasions upon which a local increase of sensibility can only be relieved by constitutional relaxation, as in some neuralgias, which can scarcely be alleviated by any local poultices, washes or bathings, but will readily yield to the general vapor bath along with systemic relaxation, secured by the use of sirups and enemata of lobelia. So, in acute abscesses, the whole body sympathizes with the local misery, and needs to be calmed and soothed. In furunculi and many forms of ulceration, also, a constitutional course of treatment is actively demanded ere the extreme sensitiveness of the part can be properly quieted—for these difficulties very commonly have their real origin in morbid accumulations existing in the blood, which, floating through the body, become a constitutional source of irritation to the abraded surface. As a broken tissue cannot be properly mended so long as its nerves are highly excited, it will be seen that much of the treatment in such cases must be of a constitutional character, and directed toward depurating the system and relieving it from all unnatural retentions. One rule, however, still holds good, namely, that those alterants which are the most largely relaxant, are to be preferred.

Constitutional Irritation.

SYMPTOMS.—Irritation of the whole nervous system presents itself in quite a variety of types. Those who have a congenital dominancy of sensitiveness, are found to be extremely susceptible to every impression, "easily worried by trifles, startled at shadows, distracted by noise or bustle, never free from some ache or pain, for almost every feeling is suffering."—(Williams's Principles of Medicine, p. 100.) When the excitement is due to over stimulation of the nervous centers (as in meningitis, encephalitis, and excessive mental exertion), the sufferings will be acute; there will be more or less delirium, spinal tenderness, wakefulness or disturbed sleep, extreme sensitiveness to the least touch or sound, flushes of heat over the surface, countenance shrunken, pulse small, rapid and flickering. When the irritation is provoked by injury, or the influence of animal virus, there will be more manifestations through the motor structures—as in the intense and long continued rigidity of tetanus and the spasms of hydrophobia. Hysteria, epilepsy and chorea, are also forms of constitutional irritation manifested through the motor nerves—the difficulty usually resulting from sympathy with an irritation of the uterine or other local organs.

But the more marked and persistent forms of constitutional irritation usually brought under the notice of the surgeon, are those which are connected with: 1st. Severe and long continued *local* irritations in those cases known as surgical. 2d. Extensive loss of tissue, as in suppuration and ulceration. 3d. Exhaustion from heavy loss of blood. 4th. Shock of capital operations in enfeebled and cachectic patients. It is under these circumstances that we witness that loss of strength, anxiety of expression, restlessness, sleeplessness and trembling pulse, which are such unmistakable indicators of the struggles going on between death and a prostrated system. The effort to resist the invasions, to sustain the structures intact and to repair the losses and abrasions, will be earnest; but the sensory and circulatory mechanism through which the vital force thus endeavors to preserve its habitation, becomes exhausted and proves unable for the task. "Prostration with excitement" is a very expressive term as applied to constitutional irritation; for, whether we examine the manifestations connected with the blood vessels, the muscles or the senses, we witness the most intense action combined with the most marked inefficiency. The pulse is quick and frequent under the finger, but its volume is very much diminished, its firmness is lost, the quantity of fluid circulated is less than is required: sometimes the beat of the artery seems almost lost, it is mostly irregular, and each pulsation seems to leave the vessel exhausted and collapsed. The muscles twitch, and there is a constant tendency to convulsive motion, an effort which denotes great prostration of the motor system. The mind is excited, but it is the excitement which approaches delirium, and may even become a mania, connected thought and calm reflection being impracticable. There is usually an intolerance of light and sound, and the cutaneous nerves of sensation are so exquisitely tender that the slightest touch causes actual pain. The stomach generally rejects food; the tongue is at first covered with a fur, afterward it becomes clean and glassy; the patient is apt to complain of tenderness of the bowels; most of the secretions are obstructed, the retained particles of morbific matter becoming a new source of irritation. If the system is not capable of resisting the causes of disease and overcoming the tendency to organic destruction, "then," as Professor Miller says, "the downward course becomes more marked and rapid. The functions of organic life are more and more deranged. Respiration becomes embarrassed and quicker; the pulse is more feeble, rapid and indistinct; the cerebral functions become more and more impaired, and strength is speedily prostrated." If, however, the vital efforts, whether aided or unaided, prove sufficient for the occasion, the secretions of the skin and kidneys will be restored early, the respiration and the pulse will become fuller, slower and stronger, and the mind will manifest less confusion and exhaustion. Health is then speedily restored; yet it must be remembered that *profuse* perspiration, diuresis and catharsis, are forerunners of rapid dissolution.

TREATMENT.—The principles to be observed in the treatment of constitutional irritation are precisely the same as those mentioned in local irritation. The tissues are to be loosened and softened, so as to allow the escape of every irritating material, by precisely the same agents; the acting capacity of the structures is also to be sustained by the employment of diffusively stimulating relaxants, as mentioned under the previous head.

Constitutional irritation is not met with in surgery except in cases where the injury done to the system is very extensive, or the body has been previously exhausted, and is, therefore, always to be looked upon as the most unmistakable evidence of serious danger. To relieve the system from the circumstances and influences which made a necessity for such an extreme sensory effort, and also to sustain the nerves (and thence the whole system) from succumbing to those circumstances and influences, will require all the skill and energy which the practitioner can command. Advantage must be taken of every means which can be brought to bear, and no channel, through which a soothing and sustaining impression can be made, should be left unemployed. The stomach, the skin and the rectum, should all be used as surfaces for conveying medicinal influences, provided no peculiarity exists to prevent the application of remedial agencies to any of them. The great object being to affect the whole system, both through the nerves and the blood vessels, the agents employed should be given in a diluted form, that they may be the more readily and generally diffused. It is not well to administer pills and powders, for they are too apt to become new (mechanical) sources of irritation; nor are sirups and strong decoctions always best. These latter forms of exhibition are often admissible, but, as a general rule, the simple and diluted infusions are to be preferred.

The degree of relaxation or stimulation employed will depend entirely upon the intensity of the irritation and the existing strength of the system. If the excitation is of recent origin, the patient hearty and the manifestations ardent, the practitioner is to consider the case as one which demands relaxation only. The system is, for the time at least, capable of performing the task imposed upon it, and the only aid that will be needed from medication will be to open the emunctories and soften the structures in order that the blood may circulate freely, the morbific materials and irritating substances is presented with a ready way of escape, the nerves relieved from pressure and the other structures saved from the threatened destruction. For this purpose, small and frequently repeated doses of an infusion of lobelia herb are of leading importance. Small, cold enemata of the same may also be given frequently; the surface may be bathed frequently with tepid water or a tepid wet sheet pack, or a general vapor bath used; and spearmint, balm, lavender leaves and similar aromatics, given as a common drink, warm and in considerable quantities.

But the cases in which stimulation is needed, are much the most numerous, though it is very seldom that pure and positive stimulants are admissible. The compound relaxing stimulants, mentioned in the division on local irritation, are among the best for general purposes—namely, zinziber, asarum and serpentaria. One or more of these may be employed (combined with lobelia if deemed necessary) and given to drink freely. Warm infusions are usually the best, provided the stomach will receive them. The system should be kept constantly under their soothing and supporting influence—an end which can only be obtained by frequent repetitions of small draughts. It is more palatable to the patient to use these aromatics without any lobelia in them, the latter article (when required) being used by enemata. When the prostration is very great, the features being sharp, the pulse very small and quick and the respiration labored, pure relaxants may be entirely omitted, and ginger, asarum and like agents, relied upon. In those rare cases where there are colliquative sweats and diarrhea, the infusions should be made stronger and given cold; small doses of capsicum (from one-fourth to a whole grain, or several of them) administered every hour, or two hours, and weak enemas of an astringent character, as bayberry, employed. Dry friction upon the surface is often very valuable in mild as well as in extreme cases. Compound spirits of lavender, carbonate of ammonia and infusion of aristolochia serpentaria, may be used freely when the prostration is great and sudden. Small doses of the compound tincture of lobelia, together with enemata of lobelia eight parts, capsicum one part, elm water a sufficient quantity, is a still more prompt and powerful mode of obtaining relief under such circumstances.

Besides the foregoing, it is necessary to remove every crude provocative of irritation which may be found in the body, as fecal accumulations, purulent material in boils and abscesses, spiculæ of bone in a fracture, shreds of decaying integument in a case of gangrene, &c. The habits, diet and surroundings of the patient must also be regulated with the utmost nicety, and every possible source of excitement avoided. But little conversation should be allowed; a bed of moderate hardness should be directed; the hours of sleep should be regulated with all possible exactness; good ventilation should be secured, and the most scrupulous cleanliness ordered, and surrounding quiet enjoined. The diet should be nutritious and easy of digestion, spices and condiments being carefully avoided. A little calm conversation with the physician or a special friend should be allowed every day, for it gives great relief to the mind; but all noise, bustle and exciting topics, must be strictly forbidden. Friction, as was remarked above, is often valuable, especially light friction with the palm of the hand carried gently over the whole surface, a part at a time being brushed. These points are peculiarly important in constitutional irritation, but are quite as applicable in cases of severe local excitement. After the intensity of the agitation has been calmed and soothed, convalescence may be treated by the use of prunus Virginiana, panax quinquifolium, scutellaria and similar tonics, which permanently relax and very gently stimulate the nervous and digestive systems. The use of the relaxant alterants will also be found useful in many cases, particularly in cachectic patients and in certain forms of ulcer.

Loss of Sensibility.

Loss of sensibility, or paralysis of the nerves of sensation, is often met in surgical practice, though a more rare difficulty than elevation of the sensory function, treated of in the foregoing section. The capacity of receiving and responding to impressions is impaired—in some cases totally so, in most cases but partially. The feelings are blunted, the senses are sluggish, circulation and respiration are slow, and the manifestations are, in all respects, quite the opposite of those in irritation.

Defective sensibility is, in many persons, congenital, or may follow some chronic forms of disease, or be a sequence of the nervous prostration consequent upon long continued irritation. As most commonly witnessed in surgical practice, it may be owing: 1st. To pressure upon the sensory centers—as, by an apoplectic tendency, determination with congestion upon the spinal cord, and tumors and osseous excrescences in similar situations or upon large trunks and ganglia. 2d. To lesion of nervous structure, either as relates to large nerves, to ganglia, or to the more important centers. 3d. To a loss of functional capacity unaccompanied with either pressure or visible lesion, sometimes arising from the depressing influence of a retained secretion, as urea; at others existing without any apparent cause.

The evidences presented by loss of sensibility will be as various as the extent of the deficiency and the connections of the portion affected. If the *cerebrum* is the seat of the difficulty, there will be a cloudiness of the mental faculties, an inclination to drowsiness, unconnected and muttering speech, and perhaps continuous stupor and actual coma. If the *cerebellum* and *spinal column* should be mainly concerned, there will, at first, be an unconscious motion of the muscular system, shortly followed by unimpressibility of the surface, drooping of the eyelids, irregular and gasping respiration, inability to move the hands, feet or any portion of the extremities, very slow and laborious circulation, coldness of the surface, harsh bronchial rattle, &c. "A person in this state" says Williams in his Principles of Medicine, p. 112, "is *too weak to sleep*, for the medulla * * cannot maintain the respiration without assistance from voluntary efforts." Or the pressure, lesion or functional inability, may occur in some portion of a sensory nerve, when all the parts supplied by it will manifest the loss, as in the numbness of the extremities of a parturient woman, the blindness of amaurosis in injury of the retina or optic nerve, loss of hearing in certain affections of the auditory nerve, and involuntary discharge of feces and urine in prostration of the nerves distributed to the sphincters of the rectum and bladder. The motor apparatus of a part may also manifest derangement through reflex sympathy with a diseased sensory trunk, as witnessed in a loss of motion in a limb, in the muscles of respiration, in the muscles of deglutition, &c.

We have seen that irritation was an *evidence of* disease: loss of sensibility is disease itself, and that, too, of a most formidable character. While a part continues to be capable of responding to impressions, it is alive; but when it becomes partially or wholly incapable of such response, it is proportionably dead. An over-sensitive patient is very difficult of management, and the system is apt to become rapidly exhausted by the intensity of the nervous efforts to remove disease: but a patient who has lost the sensibility of the system is much more unmanageable, for the inroads of disease will not be felt, all parts of the economy will perish slowly in consequence of deficient nutrition, and remedial appliances will, to a great extent, be unavailing, exerting but little influence, because of that very loss of impressibility. When the difficulty arises from extensive pressure or lesion, the danger is great; for, if it relates to a part of the nervous distributions, all that portion of the body which is supplied by that nerve will be liable to atrophy, if not to decay; and if the lesion or pressure relates to the nervous centers (as in cerebral softening, apoplexy and exostoses in the spinal canal), death is quite a certainty.

TREATMENT.—When pressure is the cause, it must be removed, if possible. If it is a tumor in the course of a nerve, an exostosis, lodgment of a foreign body, the presence of spiculæ, or the burden of a dislodged bone, relief can only be obtained by the removal of the one and the adjustment of the other. If the insensibility results from the depressing influence of a retained secretion or excretion (as of urea and feces), the latter functions must be at once restored by the proper means. If it comes from a determination toward, or extravasation upon, any of the nervous centers, the most prompt measures must be taken to invite the blood toward the surface, as this is the only way in which relief is possible. These several considerations having been properly attended to, the restoration of the function itself will next demand attention; for, as has been remarked, many cases occur where the origin was neither pressure nor lesion—and even where these have been the cause of the insensibility, long continued depression will so disable the nervous capacity that it cannot be restored without remedial assistance.

The chief remedial measure in loss of sensibility is that of stimulation, applied in such forms and to such extent as may be best fitted for particular cases and situations. Where the case is local, and can be readily reached by local applications, zinziber, aristolochia serpentaria, myrica cerifera, capsicum, myrrh, xanthoxylum and similar articles, may be applied. Waters and liniments of these agents are usually the best forms of application, poultices being seldom employed. An infusion or tincture (acetic), of one or more of the articles, may be prepared and applied over the whole part several times a day. Even in general paralysis of sensation (as also of motion) the same course may be pursued, stimulants being thus applied to the whole surface. The essential oils, as of absinthium, hedeoma, tanacetum, origanum, abies, cubebæ and cajeput, can be dissolved in alcohol and applied in lieu of infusion; but in making liniments, the proportion of the oils should be very small as compared to that of the alcohol, else their usually resinous character will form quite an impenetrable coat upon the surface. Local (as well as general) vapor baths will be found highly useful, for they invite a free flow of blood to the part—the blood being nature's own stimulant, and supplying the benumbed structures both with nourishment and vital invigoration. The baths may be medicated by adding small quantities of some of the foregoing aromatic stimulants to them, or the infusion or liniment may be applied after removal from the bath. Good friction, with a coarse towel, or a flesh brush, should be made after the baths and after each stimulating application.

In general paralysis of sensation, the same plan of management is to be pursued, the stimulants being administered internally as well as applied externally. The more permanent articles, and the more permanent forms of exhibition, are best—for a continuous influence is required. For this reason, capsicum and xanthoxylum are usually made to enter into combination with such other articles as may be suggested by the necessities of individual cases. Thus, if there is chiefly a loss of feeling (and consequently of action) on the part of the digestive apparatus, hydrastis, gentiana and populus, may be employed, a minor proportion of any of the above more positive stimulants being added. If the sensory paralysis relates more particularly to the intestinal canal, or the ductus choledochus, apocynum androsemifolium, eupatorium perfoliatum, juglans cinerea, euonymus atropurpureus or rhamnus cathartica, may be made the foundation of the articles given, and some capsicum added to make them still more stimulating. But if there is an involuntary diarrhea, the astringing stimulants should be used, as myrica, myrrh, xanthoxylum, &c. If the difficulty is mostly connected with a retention of urea, such urea eliminators as eupatorium purpureum, apocynum cannabinum and scoparius, may be combined with capsicum or guaiacum, to give them a greater intensity; or, if uric acid is retained, juniperus and cubebæ may be employed, which usually are stimulating enough by themselves. And if the loss of feeling and action refers to the whole secernent system, those articles known as stimulating alterants are to be employed, such as smilax, stillingia, guaiacum and rumex crispus; or the relaxing alterants, as alnus serrulata and arctium lappa, may be used, and a small portion of capsicum added thereto.

The general circulation may be sustained by the use of mild stimulants, as zinziber and aristolochia, with the addition of the more permanent capsicum. These may be given by enemata—the capsicum being employed if the bowels will retain it, but omitted in favor of milder excitants when rejected by the alvine canal. There are instances where considerable sensitiveness of the stomach is connected with general and more external sensory paralysis. The enemas must be largely relied upon in these cases, and great prudence be exercised, and caution practiced, in presenting even *mild* stimulants to the stomach. In this manner must the practitioner manage general loss of sensibility and paralysis of particular organs. The treatment is, of course, purely medical; but the surgeon cannot be successful without a most intimate acquaintance with, and constant application of, the great physiological and therapeutical principles which guide the physician. The relief of a general tendency to sensory paralysis is many times of the greatest importance in the management of particular forms of disease considered purely surgical, as also in the successful conduction of operations under some circumstances. We constantly insist, that the surgeon, as well as the physician, must keep before him the close inter-relations of all portions of the system; and, though a loss of sensibility may be most largely manifested in a particular organ, the whole body is apt to partake, more or less, of the same inactivity, and the part cannot be permanently restored without due attention being paid to the whole.

In addition to the above, great dependence is to be placed upon the use of electro-magnetism and electricity, motive powers which most nearly resemble the vital force and which exert the most marked stimulating influence upon both the sensory and motor nerves. The electro-magnetic power is generally preferable. The current is to be directed from the circulatory and nervous centers toward the surface, the points of application of the positive and negative poles being determined by the seat and degree of particular cases. Practitioners sometimes make a mistake in the employment of this means, using more than the case demands. The feelings of the patient are not to be consulted (as a general rule), but those of the physician must be instituted, in their stead, to determine the amount of force to be applied. A quite moderate current, directed through an insensible part three or four times a day, for the space of one-half or three-quarters of an hour each time, is better than a current many times stronger applied only once a day.

Friction is often of very great service. This has already been alluded to in connection with the baths and liniments, but its employment is sometimes of such value that the practitioner cannot be too earnestly reminded of it. Friction with the hand is best, but flannel, a moderately coarse towel, or a soft flesh brush, may be used with nearly equal benefit. Let the pressure be mild and the motion brisk, the direction being from the centers outward. The process of rubbing may be repeated several times a day, and the patient should be urged to use his own hands for that purpose as much as possible. His own physical exertions (how slight soever they at first may be), together with the application of his mind, will be found to induce a better circulation in the affected parts, and, by having him repeat the efforts several times each day, a sensible change for the better will soon be perceived. There are many practitioners who rely entirely upon the friction and motion of the patient and his friends, and their success in the treatment of insensibility, as well as of muscular paralysis, is quite encouraging.

The diet of these patients should be very plain and mostly of a solid character. Unbolted bread, preparations of corn, beans, raw cabbage and fresh and very lean meats, are, for the most part, the best. The digestive capacity and condition of separate patients must, however, be always consulted, and no doubt many will be found with whom some of these articles will not agree. In such cases the intelligent practitioner will have no difficulty in adopting the proper regimen. The point we wish to note is, that the more watery articles of diet are, as a general rule, not the best—the more heat-eliciting substances deserve the preference. But it must be borne in mind that such foods can only be used in very small quantities, and to surfeit the stomach with them is a great mistake; for a hearty meal of these articles cannot be digested by those in robust health, much less by those in an enfeebled condition.

The more general surgical circumstances under which loss of sensibility is met, as also the minute application of the foregoing principles in the treatment of particular classes of cases, will be found under the heads of Tumors, Fractures, Dislocations, Typhoid, Hemorrhage, Concussion, Amaurosis, &c.

Irregularities of Motion.

Irregularities of muscular action are very frequently met by the surgeon as well as the physician, and present a most grave obstacle to many chirurgical operations, besides interfering with the proper recovery of many surgical forms of disease. And these irregularities are liable to occur in such a variety of localities, in such diversities of degree and under such a multitude of circumstances, that a complete understanding of them should be acquired as a fundamental requisite in the surgeon's education.

Irregularities of motion are of two kinds: 1st, and chiefly, *excessive* contraction. 2d. *Deficient* contraction. Both are to be classed among nervous affections, for motion is entirely dependent upon the influence of the vital force as conveyed through the nervous system; and, as was intimated in the preceding section, elevations and depressions of muscular action are but the evidences of elevation and depression of the nervous functions more particularly connected with the motor apparatus. The student will need to revert to physiological literature in order the more fully to appreciate this truth; but we will give an outline of the facts and laws of nervo-muscular connection, both for the purpose of illustrating this position and aiding to a comprehensive understanding of the real nature of all motory aberrations.

The *will* (through the medium of the convoluted portions of the brain) has command over all the voluntary motions of the body, besides exerting a very marked, though an indirect, influence over all those motions which are classed as involuntary—as of the heart, stomach, bowels, &c. The crura cerebri and cerebelli also exert a control over the motor apparatus, but this control is entirely free from volition. The medulla oblongata and the whole anterior portion of the spinal column also preside over muscular contraction, though, as we descend from the medullary expansion at the head of the column till the point of departure of the last inter-vertebral nerves is reached, the portion of the muscular system, controlled by this columnar center, diminishes in exact proportion as the extent of the anatomical connection is reduced. This boundary of control is still further narrowed as the inter-vertebral nerves are traced toward their peripheries, each new division (generally) lessening the number of muscles under the nervous command, the larger nerves often sustaining several, while the smaller branches are each distributed to a single one. But the nerves of sensation, through the medium of reflection at the spinal juncture, also exert a powerful influence over motion; and the sympathetic nerve, with its numerous ganglia for spinal centers of reflection, is the great medium of vital transmission to all the involuntary muscular system.

These connections will be the more clearly seen, in a physiological as well as a pathological point of view, by observing the motor phenomena arising from injury to the nervous structures at different points of their course. If a small efferent nerve is severed, either by mechanical violence or chemical destruction, loss of motion in the muscle or muscles upon which it is distributed will be an immediate and invariable result. If a larger trunk, supplying more muscles, is in like manner injured, all the motor apparatus supplied by it will be similarly deprived of its contracting power. Proceeding to the spinal column, the successive destruction of the vertebral plexuses will cause a correspondently increasing loss of action, till, when the medulla oblongata is severed, all capacity for motion is lost. Yet, if the spinal column retains its integrity and the encephalon is dissevered, voluntary motion will cease and the power of automatic motion be retained. Or the spinal column, at some point in its anterior portion, may be so injured by pressure as to break off the vito-motor connection between the medulla and a large portion of the body, yet excitation of those sensory nerves which arise below that point may be so reflected through the lower portion of the column as to give motion to correspondingly remote portions of the muscular system. It must not be forgotten, however, that the structure of a muscle may be in a state of incipient decomposition, or lose its capacity of responding to vital influences transmitted through nerves which are perfectly healthy in their course, and loss of motion be thence observed. Such instances are very rare, and seldom occur in more than one or two muscles at a time, and even then the *peripheries* of the nerve distributed upon them are likely to be involved in the same decay, and the same loss of responsive capacity, in which case the muscular inability may still be referred to the nervous difficulty. In like manner it is observed, that excitation of the encephalon (as in active inflammation, or from the use of cerebral stimulants,) arouses the whole muscular structures to convulsive action, or at least so inclines them to spasmodic contractions, that a very trifling increase of the cerebral agitation will lead to general convulsions. So, stimulation of the medulla oblongata excites general automatic contractions; irritation of each descending step in the spinal column exerts a similar influence over proportionably lessened classes of fibrous structures; and excitation of individual nerves, whether in their course or upon their minute peripheries, leads to the violent contraction of only those muscles to which they are especially distributed.

We learn, then: 1st. That all normal muscular action is dependent upon the vital force, and that no fibrous contraction takes place except as this moving power exercises control over these structures. 2d. That the vital force makes use of the nervous tissues as a medium through which to reach the muscular structures, and, therefore, upon the integrity of this medium depend all regularities of motion. 3d. An excitation of efferent nervous tissue, whether in part or in whole, arouses a corresponding increase in the motor structures; and depression, or loss of functional capacity of the efferent nervous tissues, is accompanied by a similar depression of the motor apparatus. Irregularities of motion, whether excessive or defective, are, therefore, but evidences, symptoms or manifestations, of the condition of these nervous tissues. They are vital acts, consequent upon, and hence indicative of, alterations in either the function, or the structure, or both, of some portion of the nervous system. They cannot, therefore, be considered as diseases, nor as an integral part or element of disease, but simply as functional (vital) witnesses of the particular manner in which nervous structures have departed from the healthy condition. The extent of these departures is usually well defined by the degree of the muscular irregularities—very great and general convulsive effort pointing to equally extensive irritation of the nerves, and marked inability of motion showing a similar loss of nervo-vital capacity.

The surgeon, then, may well feel alarmed when a patient is seized with violent spasms; for, not only may all mechanical appliances be disturbed by the jactitations, and the strength exhausted by the exertions, and weariness follow because of interrupted sleep, but the most promising sores will deteriorate and the most convalescent patients relapse in consequence of these interruptions. Cases of deficient motion are not so immediately alarming, but their ultimate seriousness is great: for complete loss of the motor function is almost synonymous with death; and if the nervous system is so extensively impaired as to refuse vital transmission to any considerable part of the muscular apparatus, the involuntary, as well as the voluntary, portion of this apparatus will feel the deficiency. The stomach, the bowels, the lungs and the heart, invariably suffer under these circumstances, and poor digestion, tightened bowels, slow respiration and sluggish circulation, will, sooner or later, cut off nutrition from all portions of the system, leaving it to wither and fall into disuse.

The circumstances and influences which may lead to such disease of the moto-nervous structures as will induce irregularities of action in the muscles themselves, will be treated of in the following divisions of this section, where the several localities and degrees of irregular motion will be considered in connection with those conditions which most commonly become provoking causes thereof. Before reading further, however, it will be well for the student to revert to what has already been said in relation to the exciting or procuring causes of irritation and loss of sensibility. Let him also keep well before him two propositions by which to guide the exhibition of remedial measures, namely: 1st. Never destroy either the organization or functional capacity of any part of the body. 2d. Seek to relieve every unnatural manifestation by removing all materials which may become sources of difficulty, and all conditions of tissue which constitute the sum of the disease.

Excessive Contractions.—Excessive muscular contractions are most frequently found resulting from irritation upon some sensitive nerves, reflected through either local ganglia or the spinal column. When these contractions are limited to a few muscles which incline to a permanent rigidity, they are termed *cramps* or *spasms*. Among the most familiar instances of this kind, are the cramps in the legs which accompany deficient nervous action and consequent imperfect circulation in the extremities, cholera, diarrhea and other intestinal irritations, and spasmodic stricture of the glottis from the presence of some harsh substance in the trachea. These contractions are not under voluntary control, are quite distinct from any mental difficulty, and usually depend upon a reflection of irritation by a ganglionic expansion. This is the more apparent when we observe that cramps and spasms are quite local, being many times confined to a single muscle, and rarely extending to more than a set of muscles supplied by a single nerve. These mild degrees of contraction are sometimes accompanied by severe pain in the affected muscles, yet are seldom of any serious import, unless the location is such as to peculiarly interfere with some vital act—as spasm of the urethra, which may so effectually occlude the passage as to threaten rupture of the bladder from retained urine, and spasm of the glottis, which threatens suffocation.

When the impressions received upon the sensory nerves are reflected by the spinal center, the manifestations through the muscular apparatus will be much more varied than in the previous class of cases. Violent retching, hiccough and convulsive respiration, are familiar instances of this kind, following upon apparently slight provocations, as lodgment of feces in the bowels, occlusion of the gall duct, gastric derangement, piles in the rectum, &c., all of which are liable to occur in the course of many surgical cases. Spasmodic rigidity of the muscles around a dislocated joint is a common form of the reflected violence of luxation. A similar but more marked reflexed influence is found: 1st. From stone in the bladder or kidneys, which not only excites painful contractions of the sphincter of the bladder, but sometimes provokes a general shivering and tremor with a tendency to vomit, cramps in the legs, tenesmus, and (in females) a feeling as of labor pains in the uterus. 2d. From the presence of intestinal worms (whether in adults or children), which often excite to general convulsions. 3d. From irritation upon the organs of generation, leading to those spasms of the glottis, shiverings and violent convulsive efforts, known as hysteria—an affection most common to females, but by no means restricted to that sex. The teething of infants (when accompanied by much tenderness of the gums) and intestinal irritations, will also provoke extensive and violent convulsions. But the most fearful manifestations of reflexed excitement are those met with by surgeons in the forms of tetanus, hydrophobia, &c., where the introduction of either animal, vegetable or mineral poison, or mechanical irritant, provokes general muscular paroxysms of the most exhausting and terrific character.

It is altogether most probable, however, that hydrophobia, tetanus, hysteria and other excessive degrees of convulsion, are not wholly due to reflection, but that the spinal column itself becomes inordinately excited, or an erethism may exist even upon the medulla oblongata. Indeed, it seems that the mind (through the convolutions of the encephalon) participates with some of them; for the movements of the hysterical often take place with rythmical precision, and some strong willed persons have been known to control (in a measure) the paroxysms of hydrophobia. The probability of the erethism of the spinal column and its medullary prolongation being connected with these general convulsions, is rendered more certain by two considerations: 1st. That the muscular contractions are very greatly disproportioned to the apparent irritation of the sensory extremities. 2d. Because the most violent excesses of contraction follow irritation upon the medulla and the column.

And this brings us to consider those irregularities of motion which are more especially connected with the medullary centers. An increased flow of blood through the column and its membranes (as in meningitis) stimulates to both increased sensation and action—the whole muscular system being so prone to contraction, that a touch, or even a sharp word, will, at times, throw the patient into strong convulsions. Tetanic spasms are many times due to the same excitement, though the difficulty most usually "begins in a distant nervous branch and is propagated to the medullary center, the excito-motory function of which at length exhibits a state of erethism."—(Williams's Principles, fourth American edition, p. 111.) Epilepsy and apoplexy, although prominently consisting in sanguineous pressure upon the brain, manifest peculiar convulsions, which are most clearly traceable to spinal excitement; and eclampsia, catalepsy and puerperal convulsions, are mainly due to a similar excitement, though only made prominently manifest through immediate irritation of some remote sensory nerve. The presence of small tumors, sanguineous extravasations, spiculæ of bone, and other sources of pressure in the spinal column, also give rise to a strong convulsive tendency, which may be ripened into a violent paroxysm upon the most trivial occasion. These, perhaps, are the most common provoking causes of all those purely surgical convulsions which proceed from the medullary center.

Convulsive efforts, of cerebral origin, are likely to occur in all cases of cerebral excitement: as after intense study and drunken revels; in phrenitis and other cases of increased arterial circulation through the brain. The violence of mania is of similar origin, and chorea is also classed in the same category—a conclusion rested upon the fact that such patients have no convulsive or jerking efforts during sleep, but suffer the most irregular jactitations upon awakening; and these are further increased upon all voluntary attempts to control them.

Thus far we have mostly considered the excesses of contraction as witnessed in the voluntary muscles. The involuntary, especially the respiratory and circulatory, present for the examination quite as great a variety of points, both interesting and important to the surgeon. The vital character of the functions performed by the lungs on the one hand, and by the heart and arteries upon the other, and their admitted importance compared to all other structures, would at once lead us to anticipate a most minute sympathetic connection between them and every other organ of the body. In this we are not disappointed; for every physician will have observed that, in every case of disease, the pulse and the respiration will present reliable evidence concerning the degree and character of the danger. In the class of cases of which we are at present treating, the contractions of these more involuntary portions of the muscular apparatus are at times violent. Hiccough from foulness and irritation along the intestinal canal, violent cough from crudities in the trachea, esophagus and liver, and hurried and stifled respiration from material accumulations in the air cells (as in asthma), are among the more familiar instances connected with the lungs. At times the cough and sense of suffocation become alarming from their protracted severity, and hiccough, after an operation or during apparent convalescence from some surgical forms of disease, is a comparatively certain forerunner of death. The circulatory apparatus sympathizes with every degree and locality of excitement—at times manifesting its sympathy by only a slight increase of rapidity, at other times rising to great earnestness and intensity of action, and again beating with a palpitating throb upon the slightest provocation. Foulness of the stomach, feces in the alimentary canal, injury of a nervous extremity and morbid accumulations in any part or organ, will have their impressions reflected upon the heart in degrees varying according to the quality of the impressions and the feebleness of the circulatory system. The spinal center, or the sympathetic ganglia, may be the point of reflection. Irritation of the medullary column, by whatever cause it may be provoked, will also excite to excessive contractions of the heart; and cerebral excitement so largely influences the blood vessels, as to provoke to that rapidity of circulation which constitutes an actual fever. The further consideration of these sympathies and manifestations will be found in the chapter upon *Fever*.

TREATMENT.—The treatment of excessive muscular contraction consists: 1st. In the removal of the provoking causes of the irritation. 2d. In the relaxation of both the muscular and nervous structures.

When the difficulty is in the intestinal canal, as from the presence of feces, worms or indigestible food, the most prompt means must be taken for their removal. Enemas of elm and lobelia are usually sufficient for the first; these may be followed by such relaxing bitters as chelona, prunus, apocynum androsemifolium and spigelia marylandica in the second, and a relaxing emetic, with a tepid sponge bath, followed by an enema, will be the most immediate mode of affording relief in the third. Then these, or very similar, means must be continued till the stomach and bowels have returned to their proper tone, when the paroxysmal contractions will be likely to disappear entirely. But the muscular contractions may be reflected directly upon the bowels themselves, giving rise to tenesmus and an actual dysentery. Relaxing and demulcent enemas should then be given, and sitz, pack or vapor baths, employed freely for the purpose of inviting the blood from the bowels toward the surface. When the tenesmus is relieved, enemas, of some such mild astringent as witch-hazel, raspberry, currant or sumac, may be employed, the baths being continued.

If the spasm relates to the urethra, and is provoked by the presence of stone in the bladder, it is to be met by small doses of lobelia, a fomentation of lobelia and elm over the pubes, or a warm sitz bath, with plenty of elm water, gum arabic water, infusion of mallows, or similar demulcent drinks. The final removal of calculi will be considered in the proper place. So, if spasm of the glottis is provoked by solid substances lodged in the pharynx or trachea, they must be removed; if a tumor of the uterus induces contractions of that organ, resembling labor pains, its removal, either by ligature or excision, is called for; if loosened spiculæ of bone, from fractures or caries, provoke spasm of the extremities, they must be at once extracted—and, in like manner, every material that is in any way suspected of inciting to either local or general excess of muscular action, demands the earliest removal. Then, if the excitement at the point of their lodgment continues to stimulate to any degree of spasm, the local irritation is to be treated according to the principles laid down in a previous section, the muscular action being relieved with the calming of the nervous sensibility.

When the tenderness of the spinal column, or inflammatory action in the medulla oblongata, or excitement of the cerebral structure, is the origin of the convulsions, the relaxing course must still be pursued—the energy of the treatment being proportioned to the urgency of the manifestations. Lobelia inflata infusion should be given in cold enemas, which may be small in size and repeated every half hour, or hour, and some of the same given to drink. Asclepias tuberosa, with mentha viridis, forms a good relaxant, inviting the blood to the surface. Tepid wet sheet packs, or vapor baths, should be used every second day, daily, or even twice a day, as the urgency of the case demands—a strong inflammatory febrile effort requiring frequent and considerable relaxation and invitation of blood from the internal organism. When meningeal, or cerebro-spinal, determination, with excitement, gives a spasmodic tendency, very small doses of macrotrys racemosa, or leontice thalictroides, will be found very serviceable, and free draughts of an infusion of scutellaria lateriflora are of great value. Stimulating applications are usually made to the extremities: as washes of cayenne, xanthoxylum, ginger, or mustard—or liniments made of origanum, juniper or some other essential oil, dissolved in alcohol. Yet, there are many cases of convulsions dependent upon spinal or cerebral excitement, in which friction, or even a slight impression upon any portion of the surface, will be reflected in the form of violent spasmodic paroxysms. Puerperal convulsions are of this character. The treatment, in such cases, must be mostly limited to the exhibition of the purest relaxants in large quantities—lobelia inflata, by both draft and enema, being mainly depended upon. Emesis being first secured, if there are evidences of gastric foulness, warm and moist flannels may be placed under the back and upon the abdomen; or jugs of warm water, and hot irons wrapped in moist cloths, may be placed at the feet and along the sides; or a mild vapor may be directed around the bodies of patients as they lie in bed.

Excess of motion, like excess of feeling, is very exhausting to the system, and a patient, suffering from convulsions for any considerable length of time, will require to be sustained by the aromatic stimulants, or those diffusive agents which mainly influence the nervous system and combine stimulating with relaxing qualities. In the list of remedial agents of this kind may be mentioned asarum, ginger, polemonium reptans, Jeffersonia diphylla, &c. Dependence is not placed upon these agents alone, but they are largely diluted with water, combined with lobelia, and given to drink; enemas of lobelia, wet sheet packs and vapor baths, being used with energy all the while. This mode is preferable in those acute convulsions which simulate hysteria and catalepsy. In epilepsy, tetanus and other tendencies to persistent rigidity and circulatory stagnation, the more permanently relaxing and stimulating nervines are to be employed, as cypripedium, scutellaria and macrotrys. Lobelia, cypripedium and capsicum, in equal proportions, make a very powerful stimulating relaxant, known as the "Third Preparation of Lobelia," or Anti-spasmodic Drops. It can be employed to very great advantage in nearly all severe convulsive cases, but more particularly where the spasms occur during recovery from recent injury. But when the convulsions have continued for a length of time, the functional aberration becoming established as it were, the stimulants are rarely called for, even in the milder forms. Healthy action is then best promoted by the pure relaxants, which gradually insinuate and diffuse themselves through the system, opening out every fiber and quieting every irritation. Small enemas of lobelia seed in elm, with an occasional cup of warm water and milk, will answer the purpose admirably. When the introduction of some animal virus (as of a rabid dog or a serpent) has been the provoking cause of the spasms, very large quantities of lobelia should be used till complete relaxation is secured, after which stimulating nervines and vapor baths should be given freely.

It is not sufficient, in the treatment of any form of convulsion, to merely put an end to a single paroxysm. Its recurrence must be prevented, if possible. For this purpose, the management which relieved is the one to be employed for prevention. All solid substances must be removed from sensitive localities; internal pressure of blood must continue to be met by outward invitation; tenderness and irritability must still be removed by relaxants and demulcents, and feebleness and exhaustion managed by proper combinations of relaxants and stimulants. In cases where the muscular manifestations are general, the medication must be equally general and thorough, and all the energy and promptness of the surgeon will be demanded in order to secure that quiet and strength which are so important to every patient, more particularly those of a chirurgical character, or on whom any considerable operation has been recently performed.

The hygienic observations to be regarded in the treatment of motor excesses, are in all respects similar to those mentioned in the section upon Irritation. Both physical and mental agitation is to be avoided and the utmost quiet enjoined. The food should be of the most digestible kind; coffee and tobacco should be scrupulously avoided; the bowels should not be allowed, in any case, to remain unmoved more than twenty-four hours; the skin should be kept clean and free ventilation insisted upon. The application of these principles to particular cases will be found under the appropriate heads of Tetanus, Hydrophobia, &c.

Deficient Contraction—Paralysis.—Loss of contractile ability is almost invariably confined to a few muscles—to a set supplied by a single efferent nerve, to one extremity, to one side of the body. Total paralysis (whether the term is applied to deficient contractility of all the muscles, or to a complete loss of responsive capacity in a few of them) is of rare occurrence, yet partial paralysis sometimes embraces such a considerable and vital portion of the system as to seriously threaten life. Like excessive contractility, it propagates itself (if the term may be allowed), the whole organic apparatus suffering as from a sympathetic disability. For not only is the power of ready motion lost in the muscle, or set of muscles, said to be paralyzed, but the circulation through them is diminished, the part becomes cold as a consequence, the heart and arteries finally beat sluggishly, the function of the afferent nerves is lessened, and most of the secernent organs become torpid, leaving large amounts of morbific material floating through the blood to still further depress both the sensory and motor functions.

As excessive contractions are due to the influence of the vital force working through the nervous system, so loss of contractile power is to be referred to an inability of the nerves to convey vital impressions to the muscles. This inability may exist in a small nervous branch, a large trunk, a portion or the whole of the spinal column, the medulla oblongata, the crura cerebri or cerebelli, or the cerebral structure. The cause of the inability may be: 1st. Pressure, as in the numbness following some dislocations, the limited locomotion from tumors and exostoses, &c. 2d. Lesion, as when a trunk, a portion of the medullary center or the cerebral structure, is destroyed by suppuration. 3d. The depressing influence of some retained secretion, as the urea of the urine. 4th. Constitutional tendencies, which may be known by a general leaden color, a constant feebleness of circulation, and the rapid decrease of impressibility after trifling exposures to cold and dampness.

TREATMENT.—Loss of motor power is so nearly allied to loss of sensibility, and the one is so rarely found unaccompanied by the other, that the treatment is to be the same in both cases. The student is, therefore, requested to turn to the fourth section of this chapter, where will be found the rules and remedies which are most applicable to the general treatment of *Paralysis.*

CHAPTER II.

MANIFESTATIONS THROUGH THE GENERAL CIRCULATION.

Fever in General.

THE word *Fever*, as usually employed, is an ambiguous term, and does not convey any definite idea of the condition of the body in which it is present; hence the necessity for such qualifying adjectives as Bilious, Typhoid, Congestive, Nervous, &c. Any offending or disturbing cause that excites and increases nervous and arterial action will be attended with fever, and the phenomena presented will be as diversified as are the characters of these causes and the constitutional tendencies of those affected. Accelerated arterial action, with increased heat (internal or diffused), is the only invariable characteristic of fever: efficient vital action is always the *procuring* cause: the *exciting* cause is whatever encroaches upon and irritates the vital domain. Assuming that fever is thus defined, we proceed to investigate some of its various phases. This subject properly belongs to practical medicine; yet, as the surgeon is not an operator merely, but a practitioner also, having to deal with the same organized structure and meet similar morbid conditions as the physician, a thorough understanding of all the parts and functions of the body is essential to the perfection of his art. An intimate acquaintance with the nature, cause and tendency of fever, and the management of persons suffering from the various conditions that attend it, cannot be safely disregarded by the operator. The necessities pertaining to the practice of surgery are, therefore, a sufficient apology for the space we will devote to this subject.

The circulatory apparatus is the portion of the system immediately concerned in the manifestation of fever. This system of vessels, as physiology shows us, is the great medium through which all portions of the body are supplied with nourishment and sustained in an active and vigorous condition. When the blood circulates freely and fully through a part, and is also of good quality, that part will be strong and healthy. But if, from any circumstance, the flow is in any degree diminished, the member becomes proportionably feeble—a total obstruction of the circulation in a vital part leading to certain death: for, as action wears out particles of tissue, and waste always make a necessity for resupply, an obliteration of the channel through which the latter is furnished and the former carried away, will leave that division of the body both deficient in nourishment and burdened with the presence of exhausted particles, from each of which causes it will soon become useless and shortly (unless relief should be obtained) pass into decay.

The situation in which the human organism is placed, and the circumstances by which it is continually surrounded, subject it to almost endless liabilities to danger. The circulatory apparatus is especially exposed to injury; and scarcely a difficulty can be placed in the way of organic harmony but this portion of the machinery will participate in the hazard. The blood vessels of parts are liable to obstruction from a hundred forms of pressure—as from *cold* upon the whole surface, or upon the lungs, or in the stomach, or on the head, or on the genital organs; from *tight clothing* or *bandaging* upon the neck, the chest, the abdomen, either extremity or in any locality where a wound has been dressed or a stump splintered or bandaged; and from the *presence of large solids*, as the introduction of pieces of wood, stone or metal, the lodgment of a luxated bone upon an arterial trunk, &c. Or they may become wearied by long continued and excessive exertion, and thence be unable to continue the round of the blood in that perfectness demanded by health. Or the failure of either the motor or sensory portion of the nervous apparatus may leave the vessels unsupplied with a sufficiency of vital power, the contractions partially ceasing, and the flow becoming sluggish in consequence, as has already been mentioned under the head of *Loss of Sensibility*. If we count the number of *parts* of the system which may be thus pressed, wearied or deprived of vital power, and then enumerate the *circumstances* which may cause such pressure, weariness and deprivation, we will be prepared to form an estimate of the multiplicity of the occasions upon which some disturbance in the system of circulatory vessels may be found.

Every disturbance, however, is not to be considered as synonymous with death, but, when great, with danger, or a tendency to death. If the arterial and capillary structures were non-elastic, or if they were unconnected, by sensory nerves, with the fountain from which emanates the life power, very slight impediments would lead to certain destruction. But we find that the most varied and perfect provisions have been made for such contingencies, and the living principle, the vital force, the essence, the spirit or the *vis medicatrix naturæ*, which built up and now sustains and moves the animal mechanism, is ever on the alert to preserve every part of its domain. The nature and character of these provisions, and the manner in which the conservative power of the system protects the mechanism from injury, will shortly be mentioned: in the mean time we would suggest that there is an imperative necessity for some mode of arrangement by which death-inducing circumstances may be resisted. Few things are more obvious, than that such a delicate and highly complex structure should be provided with some means of defense against the encroachments of disease; and to have placed such a tender fabric in the midst of such myriads of devastating influences, without an adequate capacity for resistance and self-preservation, would have presented an instance of oversight in Creative Wisdom.

We have already shown, in the section upon *Irritation* that the sensory nerves take cognizance of nearly every injury done to the system, and give warning of impending danger, in the form of pain. When the injury is being inflicted more especially upon any portion of the vascular apparatus, the sensation is not only increased, but the contractions of the blood vessels are also increased, in the manner already mentioned in the sections upon *Irritation* and *Irregularities of Motion*. The direct consequence is, an augmentation of blood at the part. This exalted circulation furnishes new and increased amounts of nourishment, the part becomes stronger and more active, and the offending material and the abnormal condition will be removed, unless they are more than equal to the vital effort. In this case, or in the cases where damage is being done to portions of the integuments not particularly vascular, the impression made upon the sensory nerves is so considerable as to be conveyed to nearly all parts of the frame. The heart, being so intimately connected with the body at large, and furnished with such converging ganglia of nerves (if we may be allowed the expression), is first to feel the dangers of the occasion: the reflection of sensation excites it to increased activity of contraction; the arteries exhibit a corresponding movement, and the consequence is a general increase of velocity in the circulating fluid; and this rapidity of the currents is accompanied with more friction between the solids of the blood and the coats of the vessels, which is still further increased by the cramped condition of many of the channels of circulation. This friction evolves more caloric, and the skin and mucous membranes (the most vascular of all the tissues) show an elevation of temperature. In this augmented velocity of the pulse, and increased heat of the body, we have all the characteristics of *Fever*.

No two medical propositions are more self-evident than that: 1st. All functional action in the human frame is caused by the vital force; and, 2d, that the vital force is opposed to disease. We see chemical, mechanical and gravitating forces, acting in and upon the body, and man is, in very many respects, subject to both the first and the last. Water is formed by the same chemical union in the system as out of it; and oxygen will unite with iron, and hydrogen with chlorine, in those relative proportions which govern their affinities under all circumstances. Gravity, too, holds the body to the earth and the arms to the sides, and gives weight to the fluids and solids with the same exactness as in bodies not animated with a living principle. But chemistry can neither move a muscle, nor eliminate gastric juice, nor select the elements of bile, nor sustain the action of an artery, nor cause the lungs to expand and collapse. Neither can gravity raise the body from the earth at will, nor lift a leg or an arm to advance a single step or reach a single object. In like manner do we find that, though electricity, magnetism and caloric, exert an influence over the body, and are, more or less, connected with all living beings, yet they cannot sustain any functional action, and are only held as secondary to the vital force. That the vital force is opposed to disease and ever seeks to resist all encroachments upon the mechanism of the body, has been seen in the facts presented in the preceding paragraphs, and may be negatively witnessed in every case of death; for, upon the vital power releasing its hold upon the organs, they are no longer capable of action, but at once begin to molder and return to their several simple forms and elements.

The use we wish to make of these two propositions, is to have them assist us in arriving at a knowledge of the true character and design of fever. We have said and seen that fever consists, essentially, in an elevated circulation, accompanied by augmented heat as a result of the increased friction. The blood circulates only by contraction of the blood vessels—the narrowing of the tubes forcing it from the heart into the arteries, and into the heart from the veins; their relaxation making room for a further flow of the fluids from behind. All these acts most clearly result from the vital force; and, as the vital force opposes the inroads of every form of disease, fever cannot be a disease, but must be health-preservative in its tendencies. If it is a disease, tending to the detriment of the body, then either arterial action does not result from the influence of the vital force, or else the vital force tends to destroy the very structure itself has raised—two physiological propositions which no one would be absurd enough to maintain. "The most important feature in this view of the subject, is the natural tendency in all febrile diseases to run a certain course and to terminate in health."—(Gregory's Practice, p. 54.)

That this is the real nature and design of fever, might be concluded from numerous facts familiar to every medical observer. The very intention of a circulation is itself sufficient to establish it. The blood flows through the body for the purpose of supplying every part and portion with nourishment, and a free flow (the quality of the blood being good) is synonymous with vigor. If the rapidity of the current should be increased above what is reckoned as the natural standard, it is an evidence that an additional amount of nourishment is being conveyed to every fiber of the frame, or irritation causes contraction of the vessels. In many acts that are considered purely physiological, we find the most convincing evidence of this truth—as in the hurried circulation during and after active exercise, and the elevation of arterial action after taking a full meal. An increase of nourishment to the muscles is necessary to make up for the waste in the one case, and increase of gastric juice for the digestion of the food in the other, and both are furnished through the medium of the blood, the flow of which, even in these cases, is sometimes hurried to that degree which actually constitutes a fever.

Strong and continued febrile action, however, does not take place in a state of perfect health, but is always found connected with some functional derangement or structural degeneracy. It is this fact that has deceived so many into a belief that the fever itself constituted the disease; a belief which would not have been long entertained had medical philosophers firmly settled in their minds the true character of each. Disease is a *condition*—fever an *action;* and hence the two are diametrically opposed. The existence of a continued febrile effort is a most positive evidence that some injury is being done to the system—that some tissue has departed from a healthy condition—that some function is being inadequately performed. It is well known that obstructed perspiration is quickly followed by a dryness of the skin, and often of increased heat—elevated arterial action—fever. So, retained urine is accompanied by a hurried circulation; torpid liver has a hard and frequent pulse for a companion; and extensive shocks, wounds and operations, are almost invariably followed by thermal elevation and cardiac excitement; and if they are not, death is considered inevitable. In a robust frame, with the sensory tissues unimpaired, the vascular exertion is to be anticipated under all or any of these circumstances—for it is evident that the skin, the kidneys and the liver, need to be endowed with more vital action in order to be the better able to discharge their several duties, and the lesions of surgical injuries demand a lavishment of nutrition for their reparation. There is but one way in which these supplies can be furnished, namely: by means of increased circulation, which increase is fever, and has for its single aim and object the restoration of the injured parts. That this is its end appears still more evident when it is remembered that, if the wounds are healed up, the abrasions repaired and the functions of the skin, kidneys and liver, re-established, the febrile action begins to abate and health and harmony are reinstated: the arterial effort has accomplished the end for which it was established, there is no longer a necessity for its continuance, and it accordingly diminishes to the normal standard.

Accompanying high febrile action are a greater or less number of evidently unhealthy conditions—as, a dry skin, torpid liver, obstructed kidneys and inactive bowels. But no one of these singly, nor all of them collectively, constitute fever; for they may all exist where the sensory nerves are so blunted as not to take cognizance of the obstructed condition and offending accumulations, consequently no increase of vital effort is observable. Disease implies *debility*, or *inability* of an organ to properly perform its office; and the organization must, consequently, be attended with diminished vitality where no vital or febrile effort comes to its rescue. The existence, at one and the same time, of a decidedly unhealthy condition of various important parts of the body, without provoking high arterial action, would afford increased evidence of impending dissolution. The onset and continuance of fever do not offer conclusive evidence that the vital principle will be able to preserve the integrity of its house, but declare that an effort to that end is being made, and that help is, or may be, required. This effort, whether aided or not, sometimes terminates in health and sometimes yields to opposing influences. The wholesome *intention* of the effort, however, is the same, whether followed by success or defeat.

Obstinate secernent torpidity may exist, unobserved, before the accession of fever, and the sign or symptom of its existence depends on the disturbed and accelerated vital action. Waste materials may also accumulate and float in the fluid of the body till they become a source of irritation—provoking contraction of the tissues and exciting high arterial action. This vital effort may speedily remove much of the offending material from the system, while other portions may lodge in various channels and cavities of circulation and secretion and become a source of permanent irritation and injury. And, for the expulsion of virus from the body, vital action and the circulating fluid may accumulate on the surface, and sometimes in other parts, leaving other portions quiescent for the time and with a scanty supply of blood. Of this kind may be mentioned the persistent costiveness which is found in variola and some other exanthemata. Such facts may seem to conflict with the propositions just advanced, but a few moments of careful consideration will clear up the obscurity. The great arterial effort needed at the surface, to repel the virus and protect the system, requires that more blood and more vital power should be accumulated there than elsewhere, that being the point of danger. There is no portion of the system from which this blood can be so well spared as the bowels; and they, accordingly, yield up their sanguineous fluid and are found deficient in circulation. It is, therefore, from a want of irritation in the internal structures, and not from the presence of it, that the costiveness proceeds: a conclusion which finds a singular confirmation in the profuse discharges of dysentery, where arterial activity in the intestinal mucous membranes is so distinctly present.

To recapitulate:

1st. All functional action is caused by the vital force; which force both builds up, sustains and protects the whole human fabric.

2d. Fever consists in an accumulation of vital power upon the vascular apparatus, with consequent increase of action in the blood vessels.

3d. Being caused wholly by the life principle operating upon the vessels of circulation, it is not disease, but a living effort to maintain free vital action.

4th. Every structural injury and organic failure make a necessity for a febrile effort to repair the difficulty, and such effort will be made in all such cases, provided the sensory and motor nerves have not become so paralyzed that they can neither take cognizance of the danger nor stimulate to vital resistance.

The student will now be prepared to understand why it is that fever is manifested upon such a number of occasions and under such an endless variety of circumstances. There is scarcely an abnormal influence that can be brought to bear upon the system but will provoke an arterial excitement; and the occasions upon which, and the influences against which, vascular resistance will become necessary, cannot be enumerated. It is to be expected, also, that the peculiar appearances and symptoms accompanying individual cases will vary according to the circumstances under which the fever arose. If the vital effort was stirred up to resist the influences of retained bile, there is likely to be more or less yellowness of the skin, costiveness of the bowels and fur upon the tongue. If the offense lies in a non-elimination of the elements of urine, pain in the loins, scanty and high-colored urine and depression of the nervous system, will be witnessed. In like manner there will be found, in separate cases, whiteness, yellowness and brownness of the tongue; yellowness and redness of the skin; eruptions and no eruptions; costiveness and no costiveness; nausea and no nausea, and so on, countlessly. There is no manner of uniformity in these evidences; for, being so entirely dependent upon the form of the disease and the character and amount of the influences, they cannot be otherwise than irregular. These appearances, being considered as part of the fever, have led physicians to give various names to the latter, according to the evidences predominating—as, bilious, scarlet, yellow, nervous, spotted, &c. As the fever is not a disease, nor any part of disease, but always and simply an effort of the vital force, the limited utility of these cognomens will be at once perceived. Still, it is quite natural and convenient to connect the terms together; for, though fever is the same thing under all circumstances, yet the lightness or seriousness of the conditions against which it is warring, are found, at times, to differ very materially. These differences will be set forth in the peculiarities of the several secretions, as also by the sensations and appearances consequent upon the irregularities of the secretions. It is, therefore, quite proper to designate the character of the difficulty by some brief and pertinent soubriquet: as, *bilious*, when the diseased condition relates chiefly to the liver and gall ducts; *typhus*, when there is a general failure of secretion with depression of the nervous system; *exanthematous*, when there is a profuse eruption upon the surface, &c. Prefix such adjectives to the term "difficulty," "affection," or "form of disease," and follow them with the expression "accompanied with febrile effort," and both the nature of the danger and the resistance or non-resistance of the vital force, will be most tangibly indicated. We dwell at this length upon these little points for the purpose of clearing up the errors of expression which have become so stereotyped with the errors of opinion, hoping thereby to place students so upon their guard that they will not make discord between their language and their sentiments.

It has been remarked that fever is always the same; by which is meant that it at all times consists in an increase of arterial action with accumulated heat. There are, however, different grades or degrees of intensity to this action, the recognition of which is of importance in a practical point of view. When the patient is strong and robust, with a large vascular apparatus, and is suddenly brought under the influence of circumstances calculated to produce disease, the vital resistance will be ardent and powerful. This grade of effort is known as *Inflammatory Fever.* In patients of slender frames, or in those of robust frames which have been diseased for a length of time, where the difficulty consists in a general secernent inaction, with depression and tendency to disintegration, the arterial exertion will be feeble and flickering. This grade is known as *Typhus.* Where the system is exhausted by protracted efforts at resistance and makes paroxysmal and periodic exertions to overcome the depressing influence of some poison, it is known as the *Hectic* grade of fever. Where the sensory nerves are largely excited, being inordinately alive to every impression, it is called *Irritative Fever.* The peculiarities and management of these several grades will be considered presently.

Remedial Measures.—Fever has always been more or less distinctly recognized as consisting in an increase of arterial action, and this was looked upon as disease. To remove *such* a disease it would be necessary to disable the acting capacity of the heart and arteries, to take away from them their vital power, to withdraw their very lever of life. Past practices have accorded with such conclusions, and who can tell how many lives have been destroyed by the employment of lancets, leeches, cups, mercury and foxglove, for the removal of that supposed disease—fever. We have seen that fever is not disease, but a vital effort set up for the purpose of removing disease. This may seem to many to be a mere quibble upon words; but, where human life and the responsibilities of an eternity are concerned, how is it possible to insist too nicely upon language and its meaning. In the present case, the correct understanding of the subject involves the death or life of millions.

According to the view that we have taken of the essential character and design of fever, it will be seen that it is an effort to be courted, or husbanded, till the provoking cause is removed, instead of dreaded—to be aided in its work, instead of opposed. By this, however, is not to be understood that the practitioner is always called upon to make more fever, but simply to further the object for which it was set up, namely, the removal of disease. The excitement, as we have already remarked, is an unmistakable evidence that some portion of the system has departed from the normal condition; for it is an excess of action that is never maintained (for more than a few hours' time) in a state of health. The seat and character of the departures having been found out, and measures for their removal adopted, the larger portion of the labor which the blood vessels were called upon to perform, is taken off and the most direct aid rendered to the fever by this dislogment of the conditions which made a necessity for its existence. There are occasions, however, upon which a febrile action has to be actually sustained: for, where sensation is so blunted that there is no adequate response to morbid impressions, death is inevitable, unless the arterial structures can be aroused to active resistance.

The character of the assistance to be rendered is mainly of two kinds: 1st. Relaxant; 2d. Stimulant. When there is a hard and wiry pulse, a hot skin and general rigidity of the tissues, a largely relaxing influence must be exerted upon them. This is necessary, because relaxation, if of a general character, will loosen, soften and open out all the secernent organs, and place them in a condition most favorable to a steady flow of blood through them—the only condition in which it is possible for them to cast out the accumulations of morbid materials. It also leads to an enlargement of the arteries and veins, as a result of which the required amount of blood will circulate through them with less velocity than when they were narrowed by the excitement of irritation. The immediate benefit derived from this, is diminution of friction and corresponding abatement of heat. But when the pulse is feeble and wiry, the mind dull and a general state of insufficiency manifest, stimulants are required. The relaxant influence is still needed, but stimulation must be added in order to increase the acting capacity of the tissues—to enable the vital force to circulate the blood and cast out the retentions through the organs which have been prepared for that purpose by the relaxants, but of which that power cannot make use till the nervous structures have also been put in the condition which renders them most fit for the conveyance of the living principle.

There is usually a general disturbance of the secernent organs in all cases where a febrile effort is set up; yet this vital exertion is many times established to remove some comparatively limited obstruction. In both cases, however, the relaxants and stimulants employed must be those which influence the system at large—attention to the structures of circulation, as well as those of secretion, being imperatively demanded. Those agents which are most diffusive and prompt in their influence are to be the main reliance—slow and permanent articles being, in general, unfitted for the occasion. The mode of exhibition must also be made to further the general design—powders, pills and sirups, being avoided and weak infusions given with an unsparing hand. This form of administration answers the double purpose of rendering diffusive articles still more diffusive and of supplying the vascular structures with large amounts of fluid. The last consideration is one that is too commonly overlooked by practitioners, yet is of such remedial importance that a neglect of it seems quite unjustifiable. The intense thirst and obstinantly dry surface of patients, in whom a febrile effort is being made, tell, with unmistakable emphasis, of the necessity for fluids to supply the waste of friction and evaporation; and there is no form in which this demand can be so effectually supplied as by medicinal infusions.

But when febrile manifestations are made necessary to remove difficulties of a local character, constituting a surgical case, the most energetic topical treatment must be added to the general medication already mentioned. The occasion may be that of an abscess, ulcer, wound, amputation, fistula, venereal sore, or calculus, against all of which (and a great number of other affections) the vital force will labor with its characteristic energy. And this exertion the surgeon is to aid, not only by the general exhibition of relaxants, or relaxants and stimulants, but by the energetic use of those local appliances best adapted to the particular occasion. The character and uses of these will be considered under their appropriate heads in the after parts of this work.

Inflammatory Grade of Febrile Effort.

SYMPTOMS.—When a patient is robust and of a hardy constitution, the nervous and arterial structures being in a healthy condition, the efforts of the vital force to resist the inroads of disease will be correspondently strong and vigorous and the arterial exertion of the most ardent character. The earnest contractions of the heart will usually cause a distinct throbbing of the chest, and it is not unusual to see the whole frame jar with each cardiac impulse. The blood is passed under the finger with a bound and hurried along its elastic highway with a rapidity varying from a hundred to a hundred and thirty pulsations to the minute. The artery feels rigid, is not easily compressed, has a large volume and imparts a thrill of excitement to the finger of the examiner. The vascular ramifications can be traced throughout their course, the pulse being often plainly discerned in the fingers and toes and upon the scalp. Such great rapidity in the arterial current cannot but elevate the temperature of the whole body, and the skin is accordingly found intensely hot to the touch, being also dry and tightly drawn. The face and eyes are flushed with the increased circulation and the surface of the whole body may present a blush of excitement. The mind (through the brain) manifests the stimulus of the arterial flow in a wildness which not unfrequently constitutes an actual delirium. The increased friction and the rapid evaporation of the fluids make a great demand for drink; and restlessness and wakefulness are inevitable concomitants of the cerebral excitement.

All these, it will be observed, are vital actions, living exertions, and not mere conditions: the thirst and the flush of the skin being entirely dependent upon the earnestness of the vascular effort. This degree of arterial labor constitutes the *Inflammatory Fever* of the books and is considered typical of all fever, for the good reason that the vigor of the frame supplies the vital force with every implement through which to make its most determined resistance to the encroachments of disease. Its establishment, therefore, is not to be dreaded by the practitioner; for, though it is ever to be looked upon as an evidence that some considerable impediment lies in the way of vital action, the ardor of the exertion carries with it the proof that the living principle has a most vigorous hold upon the frame, and this fact always gives ground for rational hopes of recovery. If the life power should lose its control over the physical structures and only be capable of making that feeble, flickering resistance known as the typhoid grade of febrile effort, the danger is well known to be greatly increased—for the chemical force is then about to gain the mastery over the vital, when the tissues will at once begin to pass into decay.

ORIGIN AND CAUSES.—In surgical practice the inflammatory grade of febrile action is most usually connected with a local effort of the same degree. An injury having been done to any portion of the body, the sensory nerves rouse the vascular apparatus in the immediate vicinity to offer resistance. This constitutes an inflammation. If the difficulty is but slight and the parts strong, or if surgical aid is rendered at an early hour, this effort of resistance is not likely to extend any further, but will subside without any visible constitutional sympathy. If surgical aid is not rendered, and the difficulty proves too great for removal by the structures immediately concerned, the impression of danger will be transmitted from ganglia to ganglia, from plexus to plexus, till the very centers of the nervous system are reached. Keeping pace with this extension of sensory recognition, will be a manifestation of its reflexion upon the vascular system. First, the more immediate ramifications of the arteries will respond by quickening their contractions; then the larger branches will be set to work; next the arterial trunks will be aroused to increased labor, and finally the heart and the whole circulatory system will be called upon to render aid in the demonstration, and intense inflammatory fever will be established. The approach is usually thus gradual; yet there are many cases in which a surgical injury will so suddenly call upon the whole system for aid, that, by one bound, as it were, the local danger will be reflected upon the heart, without any apparent intermediate sympathy. In almost all cases of the inflammatory (and every other) grade of fever, the systemic exertion is preceded by a sense of lassitude, and then a chill or rigor. These really constitute no part of the fever, though mostly counted as such by medical writers. The lassitude is the evidence or premonition of the depression caused by disease; the chill is the rallying of the vital force; and both are usually indicative of the degree of arterial excitement which is about to follow.

But the inflammatory grade of fever is not always thus simply an extension of a local inflammation, nor is the systemic effort always a mere enlargement of the area of a local resistance. There are comparatively few cases in which such a considerable vital effort is demanded to remove a difficulty of a purely topical character; but, in the great majority of instances, even in surgical practice, marked derangement of some of the internal organs will be found. This is more particularly true in those cases where the accession of the febrile effort is preceded by the lassitude and chill just mentioned; while in cases where the general action is but reciprocal with the local, no special depression or rigor being observed, it may be safely considered that the arterial effort was established solely for the purpose of overcoming the local difficulty. The rarity of these last cases, as compared with the former, enables us to form an estimate as to whether or not this grade of arterial excitement is most generally necessitated by extensive or limited disease.

The seat, character and extent, of the organic derangements accompanying a local difficulty, and for the removal of which the febrile effort is established, are subject to great variations. Usually, however, there is more or less disturbance in every secreting organ of the body; and the practitioner, in order to form a correct opinion of the points to which he is specially to direct his aid, must take the whole series into consideration. The *stomach* is much impaired in most cases, as indicated by a heavy white or yellow-white coat upon the tongue, loss of appetite, nausea and occasional vomiting. The *bowels* are almost invariably deficient in moistness, leading, in some cases, to a most obstinate costiveness. The *kidneys* may be much obstructed, secreting but a small amount of urine, and that of a deep red or high yellow color. The *skin*, as has been already intimated, is almost invariably obstructed, the dryness of the surface being very marked. The *hepatic* secretion may also be very deficient, the *salivary glands* inactive, and the *respiratory passages* lacking in mucous lubrication. All of these deficiencies may exist in an equal degree at one and the same time; or one, two or three of them may be particularly prominent, the others being either not observed at all or very limited in extent. Their existence, however slight, offers a positive interference with every variety of surgical cases; for a wound, an ulcer, an abscess, or any other lesion or local affection which had previously been in a prosperous condition, will be found to degenerate immediately upon the accession of a fever, of whatsoever grade it may be. The effort of the life power is so divided between the surgical and the functional difficulties, that it is too frequently unequal to the removal of either. The functional disturbances being, most usually, of the greater vital detriment, the life power lends itself more especially for their removal, bestowing an inadequate amount of care upon the less serious derangements. The quality of the blood, too, is much injured by the functional obstructions, being either impoverished in the amount of its nutritive particles by failure of digestion, or rendered less fit for use by retention of morbid materials. The prosperity of a surgical difficulty, therefore, could not be expected under such circumstances.

TERMINATIONS.—A febrile effort can have but one of two terminations, success or failure. If it succeeds in its efforts to remove obstructions and restore the organs to their proper condition, the event will be made known by a re-establishment of the functional activities. A profuse perspiration, a diarrhea, or the elimination of excessive quantities of urine, are the forerunners of an abatement of the intense vascular exertion and a return to a placid and comfortable condition. These discharges are generally denominated "critical," being witnesses that the crisis has passed. They are usually profuse, the long pent materials having accumulated in such quantities, that now, having found an opportunity for escape, they are thrown out in a veritable flood. The speed with which health is restored upon the re-appearance of an obstructed secretion, should be sufficient to teach practitioners that the only way to calm arterial excitement is to assist in the opening of the glandular conduits: the profusion of the discharges established by the vital effort should remind them that they need not feel any alarm when they witness an ample secretion follow the exhibition of non-poisonous agents upon similar occasions.

TREATMENT.—The character of the aid to be furnished in a case where an inflammatory grade of fever has been set up, might be included in the single injunction—RELAX. Loosen out the tissues, soften the integuments, open a way through the whole series of secernent organs. Everything is tense, hard, rigid, tight. There is no chance for the escape of morbific material; there is no possibility of elimination. Then relax the structures by drinks, by baths, enemas, and every other possible way; using mostly of those agents which influence the structures generally, and pushing them, without stint, till you secure the desired result.

It is best to commence the treatment by administering drinks of such articles as spearmint, balm, sage and cleavers. Let weak infusions of any of these agents be made, and the patient urged to use all he can or will. The same, or similar articles, should be given as long as the arterial excitement continues, and an ordinary cupfull of a warm, weak infusion, every twenty minutes or half hour, should be urged upon the patient. The system must have fluids, and there is no more beneficial way of presenting them than in the form of some of these pleasant infusions.

The bowels must be attended to at an early hour, and all feces removed from them with promptness. Physic is not admissible for this purpose till after all febrile effort has subsided; and even then, none but the very mildest should ever be employed. Clysters are to be relied upon and used freely; a weak infusion of elm and lobelia being employed, and given warm and in large quantities. The costiveness is so obstinate, in most cases, that it is no uncommon thing to have several of these injections pass away without effect; and they may even be retained without influencing to defecation. Their use, however, must be steadily persevered in, and they should be repeated every thirty or forty minutes till the desired result is obtained, even if a whole day is required for the purpose. Nor should the practitioner cease using these clysters upon obtaining a single fecal evacuation, but continue to give them till no more feces pass, or till the enemas are returned as they were thrown in. After that, one, or, at the most, two evacuations, every twenty-four hours, will be sufficient; and not a day should be allowed to pass without such unloading of the alimentary canal.

When a foul tongue and an aching head give evidence of a disordered stomach, a searching emetic is to be administered, and repeated as often as necessary, till the coat on the tongue breaks away. Teas of the kind above mentioned are to be given freely, and then an infusion of lobelia in three or four distinct doses, again followed by tea. This is the truly relaxing course, and no stimulants or astringents will be needed; for the tension and activity of the system will be found quite sufficient to secure reaction. Indeed, the reaction is usually so prompt that not only the infusion of lobelia, but the bland teas themselves, may be rejected immediately. When this is the case, the lobelia must be given by injection, a strong infusion being used, and it given cold and in quantities not exceeding two fluid ounces. The enemas may need to be repeated every half hour till four or six are administered; but again we advise perseverance, for these means will surely accomplish the end sought, and it is not at all probable that anything else will do so with equal efficiency. The emesis should be continued till it appears that the foulness of the stomach is removed; and then it may be repeated every one, two or three days, as may be demanded. No amount of false delicacy should be allowed to interfere with this management, for when life is at stake, squeamishness must be thrown aside.

The surface must be constantly attended to, and a thorough system of bathing maintained. Sponging with tepid alkaline water, several times a day, is an excellent plan, but the application of a tepid wet-sheet pack is much more effectual. It abstracts the excessive heat from the surface, presents the cutaneous absorbents with water to take into the system, and loosens the skin, so that the circulation through it becomes free and the escape of perspiration considerable. The patient should be kept in the sheet till the face is in a fine glow of sweat, the bowels having been previously moved by enema and the bland aromatic drinks presented to the system in considerable quantities. These packs may be repeated every twenty-four hours, or twice in the same period of time, if needed. The vapor bath may also be used; but it should always be applied at a very mild temperature, and then not till the skin has been cooled, either by the relaxation or by a cold sponge immediately preceding the vapor. The alkaline spongings and the tepid packs, however, are to be preferred, and will be found the most efficient method of giving relief from the heat and tension of the surface.

But there are cases in which the energetic pursuit of even this treatment will fail to give relief, or loosen the tissues to any considerable degree. The bounding pulse will still continue and the skin remain obstinately dry; there will be a muttering delirium, high colored urine and extreme restlessness. The only course that will be effectual with such cases is the persistent use of lobelia with a view of producing complete relaxation. A very strong infusion of the herb or seed should be made, and the nurse directed to sit down by the bedside and commence its administration in tea-spoonful doses, repeating every five minutes and increasing the quantity as the stomach will bear. At the same time administer enemas of the infusion, made moderately thick by stirring the powder of the herb or seed into elm water. These enemas should be given at a blood warmth, repeated every half hour or hour as the case requires, and not more than one or two fluid ounces given at a time. If vomiting occurs, let the patient drink plenty of spearmint or sage tea. A few hours will suffice to bring the system quite under the relaxing influence of the agent, the patient manifesting all those symptoms familiarly known as the "alarm," and which have been made such a bugbear for frightening the people and professional tyros in the use of lobelia. We assert, however, positively, and upon sufficient experience, that no danger need ever be apprehended from this condition; and all the practitioner needs do, is to let his patient return to his normal state at his leisure, no matter whether one hour or twenty-four are required for this purpose. If vomiting supervenes (as it almost surely will), more teas should be given, and a good sponge bath directed after the influence of the lobelia has passed off.

The mouth of the patient often gets dry and clammy, causing much annoyance. A wash of vinegar and water, or a weak infusion of lobelia and a little capsicum, may be used. A thirst for something tart is very common, and it may be gratified by the use of oranges, lemons, vinegar and water, currants, or any other mild vegetable acid. Cold water may be allowed with freedom, though, as has been already said, the relaxant teas are preferable to all the forms of presenting the stomach with fluids. The diet allowed should be of the most digestible kind; all hygienical observances should be strictly enjoined and quiet carefully insisted upon. After the obstructions have been removed and the febrile effort abated, the bowels should be kept regularly open by enemata or the moderate use of leptandria; fresh air should be secured in the room and the tepid sponge bath used occasionally, care being taken to not employ it with too much freedom lest the skin should be softened to a degree that will allow the too rapid dissipation of heat.

Typhoid Grade of Febrile Effort.

SYMPTOMS.—When the constitution is feeble, the nervous system depressed, all the structures in an enfeebled condition, and the life principle yielding up its hold upon the frame, it is of course to be expected that the vital resistance to disease will be correspondingly feeble and inefficient. The heart will contract rapidly but unsteadily; the caliber of the arteries will be narrowed, and an effort made to regain, by velocity, what is lost in volume; the blood will pass through the tubes with a tremulous jerk, giving what has well been termed the *thready* feel to the pulse. The number of contractions may rise to a hundred and forty or a hundred and sixty in a minute, yet the amount of blood circulated through the system in the same length of time may be increased but little beyond the normal quantity. There is but a slight elevation of temperature, the mind is dull and confused, partly from cerebral prostration, partly from stagnation of blood in its smaller vessels; the demand for fluids is not great, for arterial friction is limited, and there is a constant tendency to congestion in the systemic capillaries. Such a grade of action is known as *Typhoid Fever;* it is the very antipode of the inflammatory grade just considered, and, though the vital force seeks to protect its habitation as long as it has possession of it, the feebleness of the exertion warns that the life principle is about to be driven from the body and chemical power to obtain control over it and resolve the structures into their simple elements.

This grade of arterial effort is always to be looked upon with dread; for, though the fever itself is never a destroyer, but always a preserver, the feebleness of the vital resistance is an unerring witness of the extent to which disease has insidiously obtained the control over the system. Every vital manifestation shows the most alarming depression, and the symptoms connected with the nervous system proclaim the incapacity of what may be termed the very citadel of life. The depression which precedes the febrile reaction is marked and long continued, there being a complaint of uneasiness and weakness for two, three, or even five days previous thereto. With this are yawning and frequent shiverings, followed by slight flushes of heat, as if there was a constant struggle whether the vital force could or could not rally to even a typhoid resistance. And when the life power does succeed in establishing a recuperative effort, it is, as we have seen, of such a weakly grade, that the lamp of life may be said to be constantly flickering between a blaze and total obscurity.

Causes.—The influences which reduce the organism to this extreme of debility, are multiplied and various. Every depressing circumstance which can be brought to bear upon the system, tends to prostrate the secretory organs, and this, in turn, to enfeeble the circulatory capacity. In almost every case where the heart and arteries are able to make only this low grade of resistance to the encroachments of disease; it will be found that, for perhaps many weeks, there has been a failure to eliminate from the body various waste and detrimental materials. The kidneys are prominently obstructed, as is seen in the scanty and red colored urine. The urea, which is so characteristic of this secretion, remains floating through the blood, exerting its peculiar depressing influence upon all portions of the nervous system. These structures become, as it were, saturated with those morbific elements—which circumstance is in itself sufficient to account for the exhausted condition of the vascular apparatus. But added to this may be, indeed almost always is, torpidity of the hepatic organs and occlusion of the gall ducts, by reason of which a great deal of foul bile accumulates in the system, irritating every fiber with which it comes in contact and hanging like a leaden weight upon all vital activity. This functional derangement is evidenced, from the very first, by a heavy, yellow coat upon the tongue, a jaundiced appearance of the skin and conjunctivæ and a dull pain in the frontal and basilar portions of the brain. Gastric failure, and consequent indigestion, are also usual concomitants, and a husky and flabby skin gives testimony of the addition of perspiratory poison to those of the urine and bile. And the circumstances which lead to these failures of secernent functions are also of the most enervating kind, being usually those of foul air and frequent exposures to great vicissitudes of temperature, added, perhaps, to the use of unwholesome food and tobacco, and disturbed sleep.

It will be at once seen that, when the system is in this loaded and clogged condition, having borne up against disease for a long time and being ready to yield at every moment, the slightest surgical accident will be likely to make occasion for the development of a febrile effort. An injury or an operation which, in a robust patient, would have been repaired by the local circulation alone, will, in those whose constitutions are wearied by previous burdens, make a call for a systemic exertion. The blood vessels of the part are too enfeebled to remove the impediment or build up the abrasion, and the whole vascular apparatus will be called in to aid the rescue from the threatened destruction. Nor is even this assistance always sufficient, for the arteries are so narrowed that a very rapid exertion is able to furnish only a meager supply of sanguineous fluid; and what is circulated through the part has been so impaired by the morbific accumulations of urea, bile and perspiration, as to be ill fitted for the purposes of nutrition. It is for these reasons that the surgeon should so carefully study the state of the system before undertaking any considerable operation, or expressing a favorable opinion relative to any large ulcer, abscess, gangrenous sore or other surgical difficulty. The probable accession of a febrile effort is no occasion for alarm; but if the frame is so weak that the circulatory vessels are only capable of rendering assistance of the typhoid grade, the chances for recovery are few, while those for decay and death are numerous. If the body is strong enough to render that vigorous assistance which constitutes inflammatory fever, the probabilities will be much more in the patient's favor.

TERMINATIONS.—The vital force, making use of every available channel, labors to cast out from the body the beforementioned foulnesses. In typhoid cases it does this, at times, through the skin, causing profuse perspiration, watery vesicles, dry eruptions or even boils, to appear upon the surface; large quantities of remarkably corrosive material being thus thrown out. Again, the bowels may be made the medium of discharge; profuse watery, or biliary stools, carrying away the unwholesome material. Or, the kidneys may become the passage for their escape, in the form of copious micturation, the urine being loaded with sediment. The lungs, too, are occasionally used for the same purpose, an excessive expectoration of fetid material being established. All these channels may be employed for this end at one and the same time; but it is more common to have but one or two made use of, particularly the skin and bowels. This, however, is greatly, perhaps wholly, dependent upon the peculiar functions which have been suppressed—the skin, the kidneys, the bowels and the lungs, each carrying out its own. These several discharges are no part of the fever, but sanative results of the arterial effort. They are evidences, not only of the amount and offensive character of the materials which have been retained, but also that the vital force is at least partially successful in its efforts for their ejection. Hence the practitioner looks upon their appearance with pleasure, even while they show him the real and formidable character of the difficulties which he has to aid the vital power in removing.

Before the life principle (whether alone or by assistance) succeeds in the attempt to cast out these depressing and destroying materials, the tissues of the body are inclined very strongly to decomposition. The laws of chemical affinity obtain such control and so strongly tend to resolve the structures into their simple elements, that a state of putrefaction may be said to exist in almost every severe typhoid case. This is not only seen in the coma and general depression, but is evinced by the foul exhalation from the skin, the extremely fetid breath and the black sordes upon the tongue and teeth.

The establishment of "critical discharges," however, is not by any means to be considered a forerunner of recovery in typhoid cases. They are beneficial to the system and relieve it of the dangerous load under which it has been laboring; yet the morbific accumulations may have been so great, that the very effort which succeeds in moving them also exhausts the frame and leaves it to sink still lower. Hence it is not uncommon to have death immediately follow a colliquative diarrhea or perspiration.

We would here again remind the student that the typhoid grade of fever many times follows the inflammatory grade—the obstructions which existed at the outset failing to be removed and the system becoming fatigued with the exertions it has made for the accomplishment of that end. The absorption of pus, the existence of tubercle and the introduction of many animal and vegetable viri, are also common occasions for typhoid manifestations.

Treatment.—In managing that condition of the system which exists when there is a febrile effort of a typhoid grade, two classes of remedial influence must be exerted upon the tissues, namely: relaxation and stimulation. The necessity for relaxation is at once apparent in the wiry feeling of the pulse and the tense condition of the secernent structures, which refuse an exit to the materials of the several secretions. The diminution of the size of the arteries is such that they cannot convey the proper amount of blood through the system, even though the frequency of their contractions is so greatly increased. As the rapidity of their action is caused by the vital force for the sole purpose of furnishing more nutritive fluid to all portions of the body, it is evident that that course of medication which enlarges their caliber will be most effectual in furthering this object, at the same time that it relieves the vessels from this exhausting labor and unnatural friction. And as it is this tension of the muscular coats of the secernent capillaries that interferes with the transfusion of both fluids and solids from the blood, it follows that the same loosening course of treatment will be best calculated to lead to the elimination of the elements of the several secretions. The use of stimulants (however much they may *seem* out of place) is called for on two grounds: 1st. To sustain the acting capacity of the heart and arteries after the use of relaxants has enlarged the arterial caliber; for, though the contractions are rapid they are feeble, and should have their vigor maintained, else the increase of their diameter by relaxation may leave them unable to circulate even as much blood as they did before. 2d. To arouse nervous capacity and preserve from putrefaction—stimulants acting directly upon the nervous structures and interrupting the process of decomposition. The diffusive agents of both classes are mostly called for, though small quantities of the permanent stimulants are sometimes needed, as we shall presently see.

The danger is so imminent in all typhoid cases, that the most prompt treatment must be pursued from the commencement to the termination, and the practitioner will be called upon to use his utmost energy and promptness in the application of remedial means. He should commence with the exhibition of an emetic, using a weak infusion of asarum and sage, or white root and ginger, for several hours, or till a moistness of the surface is obtained. Then administer lobelia infusion in small and frequent doses till a considerable degree of relaxation results, and follow this with an infusion of zinziber and myrica, made weak and taken frequently. This arouses to prompt reaction and secures speedy and profuse emesis. Where the prostration is *very* great, or if the practitioner meets the case during the period of lassitude and before the febrile action is established, zinziber and asarum may be used freely from the first, and small proportions of bayberry and capsicum added to them after the administration of the lobelia. Where plenty of drink has been given, and the exhibition of the inflata so managed as to secure its free relaxant influence before the vomiting is excited, vast quantities of matter will be cast out and the most pleasant relief at once experienced: the mouth becomes more moist, the coat on the tongue frequently commences to clear away, a fine perspiration breaks out and there is commonly a discharge of urine. The body should then be sponged over with tepid alkaline or weak ley water and the patient put upon the use of an infusion of sage or spearmint, to which a small proportion of asarum should be added in cases where the prostration is considerable.

But the practitioner should not expect to see these favorable results, in every typhoid case, after the exhibition of an emetic; for there are very many instances where the skin and the kidneys will remain as obstructed as before, and a slight moistness upon the tongue be the only apparent benefit resulting. And even where the benefits spoken of are derived, they are of but transient continuance, the skin usually getting husky and the mouth dry in a very short time. It will become necessary, in such cases, to repeat the emetic, and this should be done every twelve, eighteen, or twenty-four hours, according to the apparent necessities of the case. We have not unfrequently met with surgical patients in a typhoid condition, where the morbific accumulations in the stomach and hepatic apparatus were so great, as to demand removal by emesis as often as every six hours for several days in succession; for as soon as the stomach, duodenum and gall passages, are emptied of their contents, they seem to hold the relation of so many vacuums, into which the foul retentions ooze from all the adjacent integuments, demanding removal by the process before employed. These cases are rare, but the practitioner should repeat the emetics with energy whenever appearances indicate them, making them thorough and searching, and not ceasing from their employment till the natural appearance of the tongue evinces the clearness of the stomach. The quantities of unwholesome material that will be ejected on each occasion will be surprising to the uninitiated, and the relief experienced by the patient will tell the gratifying tale concerning the value of this mode of management.

The bowels require the closest attention from the very first. They should be unloaded with enemata made of small quantities of lobelia and ginger in a mucilage of elm or gum arabic. The clysters should be given lukewarm, from half a pint to a pint used at each time, and repeated every quarter or half an hour till a full evacuation is obtained. After this the bowels should be unloaded at least twice in every twenty-four hours. Small doses of leptandra virginica should be given twice a day, with the design of relaxing the liver and securing a biliary discharge. This should be continued regularly till health is restored.

A system of bathing should be pursued with scrupulous exactness. An alkaline sponge bath after each emetic should be insisted upon, for much matter is usually cast out in the perspiration during emesis and should be at once removed, that it may not clog up the pores and become a source of irritation. The use of the moderately stimulating vapor bath should be much depended upon and be employed once every day at the first, and then every second or third day till the patient is well. If he is too feeble to sit up, it can be administered while in the bed, by raising the clothing with hoops or bent wires and conveying the vapor under them. The bath should be continued till the whole body is in a free perspiration, when the patient should be wiped perfectly dry and placed in a fresh bed. Tepid wet-sheet packs may also be used, but the vapor bath is altogether to be preferred whenever it is available. The packs are liable to great abuse.

The drinks should be mainly those of a relaxant nature, as spearmint, galium aparine, seeds of arctium lappa, sage and asclepias tuberosa. To one or the other of these should be added some of the more diffusive stimulants, such as asarum, zinziber and polemonium reptans, when the pulse is very small and wiry. The quantity of the stimulants employed will depend upon the degree of prostration—in some cases only the very mildest being needed, while in others it may be necessary to use the more positive and permanent. It is seldom, however, that any more decided stimulant than ginger is required and asarum in small proportions is sufficient in a great majority of cases.

If a profuse diarrhea sets in, it is to be most promptly met by astringing and stimulating enemas—myrica, geranium with capsicum, and hammamelis with xanthoxylum, being employed for this purpose. At the same time bathe the surface with a weak ginger water, infusion of polygonum punctatum, or such other appropriate stimulus as will invite the blood outwardly and relieve the bowels. If a profuse and debilitating perspiration appears, give small doses of capsicum powder (from one-quarter of a grain to a grain every four or six hours), diminish the quantity of warm drinks, use alkaline sponges frequently, continue the dry friction for a considerable time after them and lighten the clothing upon the bed whenever the patient sleeps. The coating and clamminess in the mouth may be treated by washes of vinegar and water, lobelia infusion in vinegar, infusion of capsicum, weak tea of composition, &c. The smaller intestines, in most cases, become very tender after the system has been so relieved that the febrile effort is discontinued. This state is known by a clean, glassy red spot in the center of the tongue, gradually spreading and becoming moist till the whole surface of the organ is again in a natural condition. Small enemas of lobelia and elm, or some other demulcent and relaxant, should now be used for the purpose of unloading the bowels; the stimulants should be omitted from the drink and elm, gum arabic or mallows water, allowed freely in connection with spearmint, or cleavers, or sage tea.

At the same time the surgeon must pay the closest possible attention to whatever form of surgical disease exists, observing the utmost cleanliness in every form of sore and adopting such local management as will be most appropriate to the case. This part of the treatment will be considered in the proper places in forthcoming portions of this work.

Hectic Form of Febrile Effort.

The term *hectic* is applied to that form of febrile excitement in which the fever presents distinct remissions and exacerbations, the paroxysms of the vital struggle being followed by profuse sweating and exhaustion. It is unaccompanied by the great nervous depression of *typhoid*, on the one hand, and free from the high ardor of the *inflammatory* grade, on the other, holding an intermediate position between these two extremes of vital effort.

Hectic is only met with in cases where considerable injury has been done to some important organ, or where the frame is prostrated by excessive discharges of purulent material. The physician meets with it oftenest in patients laboring under phthisis; the surgeon may find it in any case of organic destruction or extensive suppuration, whether following the discharge of a large abscess, connected with an extensive ulcer, or supervening upon a comminuted fracture. It is upon these occasions that the hectic peculiarities will manifest themselves in the most distinct characters; but milder forms of this class of symptoms may be witnessed after almost every injury or operation where the constitutional vigor fails, either from previous ill health or subsequent bad management. When present, they always mark an exhausted condition of the system and denote an inability of the frame to repair the damage that has been done to it; hence the surgeon watches hectic with peculiar anxiety, as, unless the drain from the system is checked and the strength rallied to a degree sufficient to make no further necessity for such a form of vital reparative effort, matters will continue to grow worse rapidly till death puts an end to the sufferings.

SYMPTOMS.—The paroxysm, in this, as in all other forms of febrile action, is usually preceded by a general shivering, which is almost immediately followed by flushed cheeks, heat upon the skin and a burning sensation in the palms of the hands, upon the soles of the feet and about the ankles. The pulse ranges from ninety to a hundred beats in a minute, being quick and but moderately full and firm, holding a middle position between the hard and bounding pulse of the inflammatory grade and the compressible pulse of typhoid. The eye is peculiarly brilliant and its pupil much dilated. In a few hours these symptoms pass off, giving place to a profuse perspiration over the whole surface, which lasts from one hour to five, and is so wasting to the strength of the patient as to get the soubriquet, *colliquative*. In some instances, a critical diarrhea follows the febrile exacerbation, and at times the sweat and diarrhea appear together, when the life of the patient is in the most imminent danger. After the sweating has been discontinued, the patient feels prostrated, the skin is shrunken, the pulse soft and fluttering and the system seldom recovers its tone for ten or sixteen hours. One such paroxysm and remission are established every twenty-four hours, the febrile action usually beginning about the middle of the afternoon and the sweat commencing near midnight and lasting till toward morning. There is also a slight increase of the fever after each meal. Occasionally, two exacerbations and remissions will occur in twenty-four hours, the arterial excitement being at its hight usually about noon and midnight of each day.

The digestive and assimilative functions are seldom affected to any great degree during the whole continuance of the debility marked by hectic. The appetite is fair, the bowels are regular and the tongue is clean. In some cases, however, the stomach and assimilative organs suffer, when the tongue will present red edges and a furred center, or else be clean, glassy-red and spotted with apthous sores. A slight looseness of the bowels, with griping and high-colored urine, may also be met with at such times. The nervous system is comparatively free from participation during hectic, however long it may be continued—there being but little irritation and the mind remaining clear even to the last. Sleep is sometimes interrupted, but the extreme wakefulness of typhoid is not suffered.

Hectic may continue for an indefinite period of time, according as the exhaustion gains upon the system, or the digestive function is able to supply the suppurative waste and the circulatory apparatus to repair the abrasions. As the life power gives way before the advances of chemical destruction, the fever becomes almost constant and the sweating is profuse, scarcely allowing time for an hour's rest till the arterial excitement begins to rise again. Edema of the feet appears in the afternoon. The occurrence of a diarrhea, the accession of profuse micturation, or a large increase in the purulent discharge, marks the approach of dissolution. Before death occurs, the emaciation will proceed to the last degree, the bones will stick out prominently and the hippocratic countenance will exist.

TREATMENT.—In the treatment of those conditions which give occasion for the hectic form of vital resistance, hygiene is the first thing to be attended to, and not the last, as is a too common practice with surgeons as well as physicians. The freshest air, the purest water and the most digestible diet, must be secured. The patient's room must be kept free from noise and excitement. Tobacco, coffee, pickles, cheese and similar injurious articles, must be forbidden; fresh vegetables and lean fresh meats being made use of with just sufficient freedom to supply the demands of the system without impairing the digestive apparatus by surfeits.

In medication, the strength of the patient must be saved and the exacerbations of fever averted, as far as possible. Let us take a case in which the sweating stage has just commenced. The profuse perspiration will be readily checked by friction upon the surface, using either the hand or a soft towel for the purpose. The whole body should be rubbed briskly till the sweating ceases and the surface becomes dry and warm. The skin needs not be exposed to the air during rubbing, nor the patient permitted to perform the friction upon himself, as it would prove entirely too fatiguing to him. The perspiration being thus checked, let *warm*, *dry* linen be put on and *dry* and well aired sheets renewed upon the bed. The room should be kept at a fair temperature; and it is best to maintain a good fire in cool weather, at the same time allowing a free circulation of fresh air through the apartment, that a pure atmosphere may be enjoyed while a too intense heat is prevented. Let the covering upon the patient be light, and protect him from feelings of chilliness by free friction rather than the addition of a smothering amount of clothing upon him, for this latter practice will surely throw him into a sweat again.

After the sweating stage has fully passed by, the strength must be sustained by the use of tonics, such as eupatorium perfoliatum, hydrastis, populus and sabbatia angularis. These should be given regularly, in the form of cold infusion and in considerable quantities, but without pushing them to an extent that will stimulate the heart and arteries to an undue degree. But moderate quantities of fluid should be allowed; the food should be prepared in the more solid ways and may be regularly seasoned with a proper quantity of capsicum; enemas should be used to unload the bowels, all physic stronger than leptandra or juglans being scrupulously avoided. As the period for the fever again approaches, cease the administration of the tonics, give a lobelia pill each hour till the time for the remission approaches, then wait till sweating supervenes and begin the round of friction and medication again. If apthous sores trouble the mouth, a wash of the compound tincture of myrrh, freely diluted with water, may be used. Any tendency to diarrhea should be at once met with astringing and stimulating enemas—those of weak bayberry infusion being among the best. In the meantime, the suppurating surface, or other surgical injury which caused the extreme debility that made occasion for the hectic, must be energetically attended to. The occasions on which hectic will be most frequently found, will be seen under the heads of Abscess, Ulceration, Burns, Caries and Necrosis.

Irritative Form of Fever.

Arterial excitement, in connection with constitutional irritation, constitutes that set of symptoms to which the term *Irritative Fever* is applied. This form of vital resistance to disease presents the most diversified peculiarities. The febrile exacerbation is irregularly intermittent; at times there is an ardent reaction, while again the pulse is feeble and flickering; the mind may be wholly at rest, or it may be excited to the most furious delirium, or, still again, it may pass into coma; the patient is at all times excitable and everything points to the prominently and morbidly sensitive condition of the nervous distributions. The peculiarities of the excitement can be understood only upon a careful investigation of the sensory functions of the nervous system and the manifestations of disease through that system, as already treated of in the previous chapter. The student is referred to this chapter, therefore, as in it he will find all the symptoms which have been accredited as forming the *Irritative Fever* of authors; and then a proper perusal of the section upon *Fever in General*, together with the treatment directed for *Constitutional Irritation*, will prepare him for the management of these eccentric cases.

CHAPTER III.

MANIFESTATIONS THROUGH THE LOCAL CIRCULATION.

Inflammation and Congestion.

INFLAMMATION is the vital cause of every healing process, and is met with at almost every turn of a strictly surgical practice. It differs very much in degree on different occasions—being scarcely perceptible in simple injuries and plain incisions which heal by the first intention, but rising to a persistent and vigorous struggle in extensive injuries, severe lacerations and capital operations, and rallying the most powerful vital action for the preservation of the parts yet alive. No one feels alarmed at this *effort of nature* when it is placid and effective; but when it rises to a fierceness equal to the extent of the mischief it seeks to overcome, it is at once feared and fought against as an enemy, while the real difficulty is too often disregarded. Concerning the conflicting ideas which are entertained in regard to inflammation, Professor Miller (Principles of Surgery, vol. i, p. 108) justly observes; "This term has been made to include too wide a range of action, * * rendering the cause of simple effusion one and the same with that of suppuration, ulceration and gangrene; uniting, as if in one harmonious operation, the healing of a wound with its gaping and suppuration—the gradual enlargment of a part with its destruction and discharge—the death of a portion of bone with the formation of its substitute—the successful reunion of a broken limb with the suppurative arrest and undoing of the callus—the infliction of an ulcer with its process of healing: all, however dissimilar, declared the offspring of one common parent—inflammation." Had Professor Miller clearly seen that inflammation *always* consists in disturbed and excited vital action, he would have been able to avoid the surgical contradictions which he found himself unable to reconcile. Inflammation is the natural and necessary result of vital effort accumulated upon a given part for the purpose of preserving it; while suppuration, gangrene and mortification, take place only in those portions of the body which have fallen under the control of chemical affinities.

Absurdity and contradiction must continue to mar the pages of medical literature till life comes to be regarded as an innate procreative principle, rearing its tenement and preserving it, for a time, amidst the influence of opposing forces—manifesting itself in a great variety of ways during its labors to develop, protect and repair its "earthly habitation." The surgeon, from his stand point, should be able, in the light of physiological science, to take correct observations of both disease and health—to discriminate between *vital* acts and acts which are purely *chemical*—to draw a distinct line between the formative and preservative labors of the vital power and conflicting chemical affinities. Then it is that he will recognize the great natural truths, that one motive power of the universe continually labors to build up organic structures and an entirely different one tends continually to their dissolution. With an understanding thus enlightened, there will be no necessity for confounding "the infliction of an ulcer with its process of healing," or "the death of a portion of bone with the formation of its substitute;" for the line that separates vital from chemical action will have been clearly defined and every simple or complicated series of effects will each be readily assigned to its appropriate cause.

The practitioner, whether medical or surgical, should make himself thoroughly acquainted with these two motive powers in a state of both health and disease. The life principle, or disease-resisting power, is the one that he is called upon to aid; and all the means he may use, and all the appliances he may make, can never result in any benefit to the patient, unless they are of a character calculated to assist this vital force in retaining its hold upon the frame and resisting the tendencies to chemical destruction: for, if the chemical power usurps the control of the animal fabric, death is the inevitable result. How futile, then, would be the efforts of that practitioner who has not learned to distinguish between these two opposing forces? and how unlikely would he be to succeed in his attempts to heal, not being able to make a distinction as to which of the processes he is to aid, or which to guard against? Yet this is the position of every surgeon who confounds inflammation with suppuration and gangrene, or who considers the one as being any part or portion of the other.

Inflammation may be briefly defined as *a local accumulation of blood, with increase of vital action in the part;* in other words, a circumscribed fever.

Congestion, on the other hand, though generally accounted as one degree of inflammation, is *a suspension of capillary circulation*, a stasis of the blood, either as relates to a part, or the whole, of the sanguineous apparatus.

It will be seen that inflammation is a vital *act* and, therefore, opposed to disease—the rapid circulation of blood through the part being designed for the removal of some impediment or obstruction to the free play of the life principle. (See section on *Fever.*) Congestion is the very opposite of this, the blood coming to a stand instead of going its rounds with increased energy. The supply of nourishment having been cut off in consequence of this stasis, the part inclines to gangrene—mortification—death. The commonly observed fact that congestion (obstruction) is almost invariably accompanied by inflammation (vital effort for the removal of obstructions), has led medical men to class them both under the head of inflammation—distinguishing this effort into *healthy*, when it succeeds in repairing wounds, uniting fractures and healing stumps, and *unhealthy*, when in any way connected with destruction of tissue in consequence of congestion. But, if scientific terms are to be considered of any value and deserving of any exact estimate, then inflammation and congestion—action and inaction—flow and stasis—should be placed in their true antagonistic positions and never again confounded. Nor should healing and destruction be any longer classed as results of the same thing, when it is so evident that they are terminations of such opposite influences.

Scarcely an impediment or injury, whether mechanical, chemical or functional, can be mentioned, but an inflammatory action will be established for its removal. If the obstacle is trifling and the system vigorous, the inflammation will soon overcome the difficulty and all will subside into the former quietness. But if the obstruction is greater than the vital force can remove, it becomes a center of stagnation; the capillary exhaustion, consequent upon the arduous effort, will favor this stagnation and complete congestion take place. The establishment of inflammation, therefore, is proof of the existence of some impediment to free action; its protraction evidences that the obstruction is considerable and gives ground for apprehending that the vital effort may be insufficient for its removal when congestion will take place; the accession of congestion, by cutting off local nourishment, is a forerunner of structural disintegration.

These propositions are fundamental. It will be seen that they are the very antipodes of the existing opinions upon this subject. The importance of their free discussion will be at once admitted by all; for their correctness or incorrectness underlies the whole system of surgery, in both a theoretical and practical point of view, and is, therefore, a question which concerns the lives of the millions who are yearly liable to surgical treatment. This is a sufficient apology for the space we intend to devote to a consideration of inflammation and congestion in all their phases and connections.

Simple Inflammatory Effort.

The simple form or grade of inflammation is seen upon the application of some irritant to a part, as of alcohol upon some transparent structure, dust upon the conjunctivæ, or powder upon the lining membrane of the nose. The impression made upon the nervous peripheries by such appliances is conveyed to some contiguous nervous ganglion, and from thence reflected upon the capillaries and smaller arteries in the form of moto-vital influence, as was explained in a section of the first chapter. Recognizing the presence of foreign substances, this reflexion of sensation arouses the blood vessels to an effort for removal. These vessels are first observed to diminish in size, as with a transient spasm, and then to begin gradual dilation and increase of contractions, hurrying the circulation through them with more than natural rapidity. The vascular coats continue to enlarge and the blood to be determined to the part, till a slight tumefaction and a gentle blush are observable. Capillaries which were formerly invisible now become quite distinct under the microscope, and tubes, which before admitted only colorless corpuscles, or, at most, but single rows of red ones, now give ingress to several files of the latter. The stimulus of this increased flow of blood, together with the pressure of the turgescence, arouse the nervous peripheries to greater sensibility, which may even amount to slight pain, though generally to nothing more than an uneasy itching. This exaltation of feeling is, in turn, a second time reflected upon the vascular apparatus, furnishing new excitement for a further increase of the sanguineous determination. The capillaries and smaller arterial ramifications gradually continue enlarging, the pulsations remaining as vigorous as before, though the increase of diameter causes a diminution in the velocity of the current. The blush of redness usually increases in exact ratio, the turgescence keeps pace and a very slight elevation of temperature may be observed in consequence of the friction of the excited circulation.

The pressure of arterial fluid from behind continuing, while the capillary coats of the part are thus thinned by distension, a transudation of the serous portions of the blood is observed. Upon mucous surfaces, this transudation may be very free, as is witnessed in the flow of nasal mucus under the influence of the inflammatory excitement. The serum may also be exuded among the intercellular spaces. In secernent organs the function is more or less actively increased, as is observed in the excess of lachrymal and salivary secretions when dust gets into the eye or spanish flies into the mouth. The determination of blood, the redness, the heat and the turgescense, corresponding, in every respect, with the grade of inflammation we are describing.

It will be seen that this process is nothing but a purely healthy one. It is present during the natural process of digestion and it is only by it that the stomach can manufacture gastric juice to chymify the aliment. It enables the eye by its tears, the mouth by its saliva, and the nostril by its mucus, to wash away all slightly offending substances. By it the virus of small-pox is cast out upon the surface and the poison of measles expelled. It also strengthens the skin by being established upon the surface after a bath; it repairs light scratches and minor burns; being set up, on all such occasions, as will be readily seen in the smarting, redness and heat of the injured parts—and, upon the occurrence of a thousand other trifling accidents, it becomes the means of protection and reparation. It is a purely vital effort, for it consists simply in an increased action of the local blood vessels, and (as we have seen in the chapter upon *Fever*) all action, whether of blood vessels or other structures, comes only from the vital force. As a consequence of this circulation, all parts, in which the increased vital effort is established, are supplied with a greater amount of nutritive material. No physiological proposition is more simple, or better understood, than that the amount of nourishment supplied to a part determines its health, and, therefore, its ability to resist disease and all forms of injurious impressions. What, then, could be more perfectly natural, or more beautifully in accord with simple laws, than the establishment of imflammation as a means of vital protection against all foreign encroachments?

The grade of inflammation of which we are at present speaking does not often need professional assistance, being sufficient, in a great majority of cases, to accomplish the end for which it was established. If the circumstances which made a necessity for its development are of a trifling character, a few hours will usually suffice for their removal—when the equilibrium of the flow will again be restored, the vessels of the part regain their natural size, the swelling and redness disappear and all the operations go on with their wonted harmony. Or, the difficulty may have been greater than nature alone would have readily removed and art has been called in to her assistance—as for the plucking out of a sliver from the hand, or the dislodgment of a grain of sand from the eye. The obstacles having been removed, the harmonious circulation through the part will be restored, as before. But there are many occasions upon which neither the mild grade of inflammatory effort, nor the early interference of art, will so effectually remove the provoking causes as to allow the exertion to subside at once. It may, on the contrary, continue with increased vigor and constitute a higher grade of action, which we will proceed next to consider.

Higher Grade of Inflammatory Effort.

This is but a *continuation* of the former degree of vital action. The blood vessels of the part become still more dilated; the redness is, in consequence, greater, and the exudation is much increased, causing decided swelling. The amount of blood sent to the part is greater than before; the larger arteries participate in the exertion; and, upon transparent surfaces, the smaller ramifications become visible to the naked eye. There is a more or less distinct throbbing in consequence of the exertion of the larger vascular trunks, the action of the heart is more decidedly increased and the pain from pressure and excitement considerable.

Up to this stage of exertion, the circulation, as a general thing, has not suffered any actual retardation, but has flowed through both arterial and venous capillaries without interruption. The impediment which gave occasion for this local excitement remaining unremoved, the venous radicles will be seen to contract, diminish in caliber and finally become partially or wholly closed up. The source of difficulty (whether a solid substance, an abrasion, or debility resulting from violence) becomes a center of occlusion, preventing the free flow of blood through and beyond it. This obstruction extends, by accumulation of atoms, as it were, toward the cardiac side of the circulation, gradually widening its area and becoming more and more complete, till total stagnation takes place through a large space. We then have inflammation and congestion existing together, at the same time and in almost the same place. As this association of flow and stasis has been the source of endless difficulty and misapprehension on the part of medical authors, we will consider them, as thus connected, in their minutiæ—not attempting to vary the several phenomena as they have been observed by former authors, but simply separating them in such manner as to refer them all to their proper places.

The first evidence of a tendency to an interruption of the free transmission of blood, will be seen in a marked tortuousness of capillaries which were previously straight, or but slightly curved. The distension, before mentioned, makes all possible accommodation for the ingress of the nourishing fluid: but when the passage of that fluid begins to be opposed, the contractile force from behind continuing to drive on a large supply, the coats become more over-distended at some points than at others and present a winding and knotted appearance. An accumulation of lymph globules, and afterward of red globules, is next observable. The liquid portions of the blood still find a passage through the narrowed extremities of the veins; but the corpuscles are left behind and, being now no longer hurried along over each other, are soon found attaching themselves together and crowding their sides into hexagonal shapes. These corpuscular junctions usually commence at the surface (or against the coats) of the blood vessels, and gradually extend till the whole channel of both capillaries and small arteries becomes filled, making a further extension of the stagnation and offering a new obstacle to a free flow. The union of the flattened edges appears to be quite firm, as if they had formed a rude, incipient tis-

FIG. 1.*

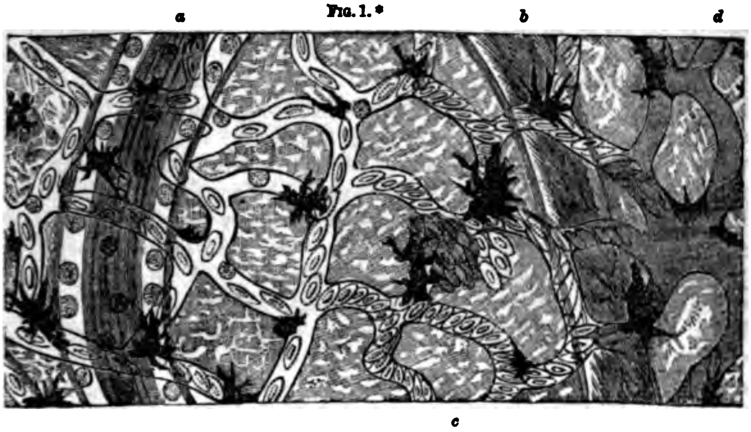

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*FIG. 1.—An exact copy of a portion of the web in the foot of a young frog, after a drop of strong alcohol had been placed upon it. The view exhibits a deep-seated artery and veins, somewhat out of focus, the intermediate or capillary plexus running over them, and pigment cells of various sizes scattered over the whole. On the left of the figure, the circulation is still active and natural; about the middle it is more slow, the column of blood is oscillating and the corpuscles crowded together; on the right, congestion, followed by exudation, has taken place [and is the part at which decomposition will commence].

_ *a*. A deep-seated vein, partially out of focus. The current of blood is of a deeper color, and not so rapid as that in the artery. It is running in the opposite direction. The lymph-space on each side, filled with slightly yellowish blood-plasma, is very apparent, containing a number of colorless corpuscles, clinging to or slowly moving along the sides of the vessel. *b*. A deep-seated artery, out of focus—the rapid current of blood allowing nothing to be perceived but a reddish-yellow broad streak, with lighter spaces at the sides. Opposite *c*, laceration of a capillary vessel has produced an extravasation of blood, which resembles a brownish-red spot. At *d*, congestion has occurred, and the blood corpuscles are apparently merged into one semi-transparent, reddish mass, entirely filling the vessels. The spaces of the web, between the capillaries, are rendered thicker and less transparent, partly by the action of the alcohol, partly by the exudation. This latter entirely fills up the spaces, or only coats the vessel.—BENNETT.

sue; and they remain in this position either till the action subsides or the surrounding structures begin to decay, when they will escape (some of them whole and some ruptured) with the discharge of suppuration, mixing with the shreds and globules of pus.

In this way we observe the beginning and the advance of stagnation or congestion. The accumulation of corpuscles does not take place immediately, but proceeds by layers. As the liquor sanguinis passes through the blood vessels, and the proportion of fluids to solids is thereby diminished, the corpuscles are seen to whirl about, as if in eddies—not rolling along with their previous grace and regularity, but tossing about as in a great commotion. Where the impediment is of a limited character—for instance, in the weakness of vascular structures consequent upon a slight bruise or too tight bandaging—complete stasis may not take place, both corpuscles and liquor sanguinis finding their way through into the return circulation, the former merely being delayed, not actually stopped. Where the primary obstruction is considerable, the stagnation of course commences in proximity with it and extends on the cardiac side. In simple cases—as the presence of a small sliver of wood, piece of glass or grain of sand—this stagnation may not extend more than a few lines at most, and even require several days for that: but where the obstruction constituting the difficulty is more considerable, especially if it has its seat in a structure of a highly vascular character, the space over which congestion will take place will be equally large, and the rapidity of its accession will correspond with the activity of the normal circulation of the part, a few hours being sometimes sufficient to develop corpuscular occlusion several inches in circumference.

While this congestion is thus advancing from the original obstruction toward the heart, the blood vessels on the cardiac side continue their inflammatory labor. Indeed, the contiguous arterial trunks may increase the energy of their exertion; for, as the area of obstruction becomes greater, the need of vital resistance becomes more imperative, and a corresponding increase of effort will be observed. The determination of blood to the part may, therefore, be even greater than before; but now, meeting with so bulky an obstruction through which it cannot be transmitted, it makes a side channel and passes around. In this way the inflammation continues to extend and the congestion to widen its limits, till the obstruction becomes so great that the aid of the whole arterial system is needed for the purposes of resistance, when fever is established, as was mentioned in the previous section.

The feeling and appearance of the part will now be different from what they were before. As the circulation is blocked up from point to point, the arterial effort will be increased in energy, the vital power making renewed exertions to retain its hold upon the threatened structures. This exertion is now no longer a mere smarting pain, but an arterial *throb*, which makes the nervous peripheries jump with suffering at each accession of pressure. The color of the parts through which the blood is flowing will be of the arterial scarlet brightness; but, at those points where its course is almost entirely obstructed, a purple hue is observed. As the congestion begins at the point of the primary impediment, it is usual to find the purple appearance of stasis more or less nearly in the center of the area in which inflammatory action is going on. But this is not always the case; nor is there likely to be at any time a distinct line of demarkation between the arterial flow and the capillary congestion. We have seen that the corpuscular accumulation, and consequent stagnation, take place gradually; hence, as we traverse from the center of inaction to the circumference of action, we find the changes imperceptibly lost in each other, and the hues of congestion and inflammation will, of course, be blended with corresponding diffuseness. Nor does the purple of congestion always present a regular outline; for, as stagnation takes place first in the smallest vessels, it most usually happens that numerous meshes of capillaries will be wholly occluded, while little arteries which run among them will be perfectly free for sanguineous transmission. When this is the case, the lividity of stagnation will be visible in spots, with the scarlet of inflammation running through them. The two appearances may be likened to the light and dark shades of the polar light, and the dispersion of the two hues of inflammation and congestion is likely to be as various and fantastic as the bright rays and dark ground-work of the aurora borealis.

We have seen, in the *Simple Form of Inflammation*, that there was a transudation of serous fluid among the interstices and upon the surfaces of parts inflamed. In these cases, where the obstruction is greater and the arterial effort more intense, this exudation is much increased. As the corpuscles fill up the arterial radicles, the passage of even the liquor sanguinis is prevented. The distended blood vessels press upon the absorbents and so disable their functional capacity that they can no longer take up the surplus fluids. But one channel of escape now remains for the liquor sanguinis, namely: among the intercellular spaces. This escape is furthered by two circumstances: 1st. The extreme thinness of the capillary walls consequent upon the over distension. 2d. The unusual impulse given to the blood by the ardent inflammatory action. From these several influences and circumstances combined, the amount of fluid exuded is considerable, causing a marked swelling of the part and increasing the pressure upon both the absorbents and nerves.

Very great differences, however, are observable in the character and quality of the exudations. At the congested points the fluid poured out among the intervascular spaces will be decidedly thin and watery. It is so far removed from the nutritive influence of a free circulation, that it seems to have lost all its really vital qualities, or, at least, lost them to so great an extent, as to be ready to pass into decay at the very moment of transudation. A soft, flabby and literally *quaggy* feeling is given to the part thus occupied; and the degeneracy is such, that decomposition is anticipated at all those points where such a feeling evidences the transfusion of a fluid of this character. Indeed, chemical destruction not unfrequently commences before this liquor escapes, the walls of the blood vessels themselves softening, giving way and allowing both fluids and solids, water and corpuscles, to escape into the cellular spaces. This, we say, takes place in those portions where inflammatory action has ceased and the congested condition exists—where nutrition by circulation has been cut off and the control of chemical laws has become predominant. It is, therefore, neither a part nor a result of inflammation, but of congestion—which is the very opposite of inflammation and only exists because inflammation cannot succeed in overcoming the impediments to vital action. This form of incipient destruction should not, on these accounts, be considered under the head of the inflammatory process; but we introduce it here in order to open the way to its true explanation, it having been heretofore classed as a termination of local arterial action. It will be considered at length, in its true position, under the head of Suppuration.

When we get beyond the area of stasis and approach the borders of the current which constitutes inflammation, we then begin to observe the exudation that properly belongs to arterial excitement. This consists of a sero-fibrinous fluid, white, plastic, possessing a degree of vitality and resembling rather a secretion of albumen than a mere unvitalized transudation. This fluid is poured out from the capillary coats among the intercellular spaces, without any rupture or injury to the vessels. Upon being thus thrown out, it is found inclined to structural formation, and will shortly be seen to organize itself into a low quality of tissue, half fibrous and half cartilaginous. In this manner is it built like a wall round about the congested portions which are inclined to decay. It is firm to the touch, moderately elastic, void of any particular blood vessels or nerves, and yet most decidedly possessed of vitality. It stands as a protection between the product of decay, which it surrounds, and the sound tissues beyond the circle of inflammation. It is composed of just that kind of material which, as we will see in the section upon Suppuration, is the least liable to yield to corrosive influences, and is, therefore, the best barrier to the extension of decomposition. This plastic wall is the direct result of the inflammatory action, and constitutes the first means used by the vital force in the accomplishment of its intention—the removal of the obstructions to free arterial flow.

SYMPTOMS.—We have now, in the past sections, shown all the phenomena connected with inflammation and pointed out the manner in which this vital action is blended with congestion or vascular stasis. These, as has been said before, have usually been treated as one and the same thing; and recently the condition of total stagnation has been distinguished as the *true* inflammation, while the excited local circulation has been considered as *active congestion*, or, what would have been equally lucid, a moving stillness. If scientific terms are to have any significance, there must be one word for stasis and another for flow, and the two terms should not be confounded any more than the two things. It is for this reason that we have been so careful in pointing out the differences between inflammation and congestion—distinctions which are of fundamental importance and which, as the coming portions of our work will show, cannot be too well investigated by the surgeon.

The most frequent evidences of the existence of inflammatory action, are, *redness*, *heat*, *pain and swelling*. Congestion, previous to destruction of tissue, is known by the same characters, with slight modifications. As inflammation is not a disease, the manifestations of its existence are not in themselves dangerous; but, as their intensity and extent are witnesses of the extent of the obstruction to vital action, and, *therefore*, of the degree of danger, they should be studied well and carefully. It is true that inflammation never destroys, nor becomes a cause of destruction; yet it must not be forgotten that the grade of arterial exertion, other things being equal, indicates the amount of difficulty in the way. If the impediments are of a trifling character, they are likely to be removed with ease—hence but a moderate degree of inflammatory effort requires to be set up for the purpose. But, if the impediments are large and occupy a considerable space, the danger of congestion and destruction are proportionably great, and a much higher grade of vital exertion will be needed for the protection of the system. The intelligent practitioner must understand when congestion is most likely to take place and become familiar with every evidence of its existence; for, as the accession of stasis constitutes the precipice of destruction, and is really the first point of danger to be guarded against, no rational opinion upon the most appropriate treatment, or the probabilities of the termination, can possibly be formed without a perfect acquaintance with every minutia connected therewith. For these reasons we will set aside this section for a consideration of the evidences of inflammation and congestion, endeavoring to point out the importance to be attached to each and the significance of their several varieties.

REDNESS.—We have already seen that the redness accompanying both inflammation and congestion is due to the increase of red corpuscles in the part. The minute vessels becoming distended and the liquor sanguinis passing through the venous radicles and leaving the solids of the circulation behind, a large accumulation of globules is a necessary consequence. The change of color is not a result of an increase in the number of blood vessels, but simply of the greater amount and density of the blood in those already existing. An example of this redness may be seen in the sudden flow of blood to the face constituting a blush, and in the glow following active exercise, friction, or a warm bath. In these cases, an excess of sanguineous fluid is invited to the surface and the capillary vessels give way before it—the color appearing deeper than natural, for the same simple reason that a flask of wine looks of a deeper hue than a prescription vial filled with the same.

We know the color of arterial blood, in a state of circulation, to be a bright scarlet; but, when it is drawn from the tubes and allowed to stand, it changes to a purple brown. Precisely the same alterations are noticeable in the blood in the system. That which is circulating freely, retains its scarlet hue; and in the inflamed part, where both the amount and density of the circulation are augmented, this brightness is increased to the most vivid tint. But as the flow becomes impeded, the shade is correspondingly changed, till, when total stagnation exists, the complexion is dark, resembling a mixture of black, brown and blue. This is the decided venous or carbonaceous hue; and, whenever it is found in any portion of the living tissues, whether surrounded by, or intermixed with, the brightness of arterial action, or wholly unaccompanied by any such exertion, it is an unmistakable evidence of approaching destruction. The vital force has lost, or is losing, its control over its two great channels—the nerves and blood vessels; and all parts thus deprived of the means of sustenance must die. If the stagnation exists in some important organ, or if it is found over a large surface of some less vital structure, the danger to the whole body is proportionably imminent. Sometimes both the scarlet color of inflammation and the venous hue of congestion are tinged with a shade of yellow, as in what is termed bilious erysipelas. This indicates the presence of large quantities of biliary elements in the blood, and always increases the seriousness of the case; for the bile so depresses the vital capacity of all the tissues that a successful inflammatory exertion can scarcely be established, or a barrier of plastic fibrin built up, for the protection of the system against the encroachments of the products of decay.

But the degree of these several tints will vary in different localities, being much greater in some places than in others. The reason of this will be readily understood by remembering the simple anatomical fact that all tissues are not alike vascular. In mucous membranes, as the conjunctivæ, the scarlet of action and the purple of stagnation will be very marked—the blood vessels there being numerous and the looseness of structure admitting of very great distension. Upon the skin, where neither the vessels are as numerous nor the distensibility as great, the two hues will still define the two conditions clearly, but neither will be quite as vivid and marked as in the other case. In tendons and cartilages, on the other hand, no appreciable redness nor swelling can be seen by the naked eye, even when all the other evidences of inflammation and congestion are unmistakably present; for the fineness of the capillaries in these structures allows the ingress of only white blood and the density of the parts is such as to make it impossible for arterial pressure to distend the coats of the vessels to a size suitable for the passage of red corpuscles at any time.

The redness of both inflammation and congestion is quite fixed and cannot be readily dispersed. Pressure will cause a paleness for a few moments, but the removal of the pressure is followed by a return of the color. When the pressure is made upon those portions where the inflammation is going on, the paleness which follows is of a clear white; whereas, upon the congested portion, it is of an ashy lividness. The color usually continues for some time after both inflammation and congestion are at an end—the distension of the capillaries and the accumulation of red corpuscles remaining and subsiding gradually.

HEAT.—Animal heat is mainly the result of action and friction. In an inflamed part, both these are present; and the increasing activity of the blood vessels and the unusual friction of the rapid circulation through them, lead to a decided elevation of the temperature. This elevation, however, is more cognizable to the patient's feelings than to the thermometer; for, while the application of the latter to the part may not indicate an increase of more than one or two degrees of Fahrenheit, the patient will complain as if the part had sufficient caloric in it to cause an actual consumption of the structures. This is mainly owing to increased keenness of sensibility, but also arises from the actual diminution in the fluids of the part. We have seen that the liquor sanguinis escapes through the venous radicles before stagnation actually takes place. This leaves the blood vessels with too many solids in them. The adjacent tissues of necessity become too dry, and, as we may say, crisp. Heat is felt, and the sensation may be likened to a local thirst—a craving for water with which to lubricate the parched structures. This opinion is further confirmed by the fact that patients complain of the greatest amount of heat at those points where the circulation is least rapid, yet where congestion does not actually exist. When stasis becomes complete in a part, the sensation of a prickling heat is almost wholly lost; and, at the circumference of the excitement, it is scarcely increased above the normal standard, *i. e.*, the *feeling* is more nearly in proportion to the actual thermal elevation as indicated by the thermometer.

SWELLING.—The swelling of an inflaming part is due to the unusual amount of blood which is accumulated in it and fills up the distended capillaries. This in itself, in highly vascular structures, is often sufficient to cause great enlargement; but by far the greater amount of swelling is the result of the exudation among the intervascular spaces, of which we spoke at some length in the previous divisions. This exudation, as was remarked, is of two kinds, occurring at two places and resulting from two causes. We will consider them separately.

The exudation which occurs in the center of congestion, may be really considered a transfusion, being literally a filtering of liquor sanguinis through the thinned walls of the capillaries. The walls sometimes break down suddenly and allow the extravasation of blood, which is uncoagulable and will not form a clot, even though it should remain thus effused for several days. This escape of fluids is directly aided by incipient destruction of the capillaries themselves, which always become softer and more frangible upon the accession of congestion, being the first both to feel and evince the loss of vitality. When the stasis occurs suddenly and the blood from the cardiac side makes an energetic effort to force for itself a passage, the vascular walls are most likely to yield before the pressure, the liquor sanguinis, fibrin and corpuscles, all escaping together. When the congestion takes place slowly, or is not really complete, but still allows the escape of some of the thinner fluids through the venous capillaries (the surrounding inflammatory effort not being very ardent), only the more watery portions of the blood escape, and that without any rupture of the vessels. It is, for the most part, wholly devoid of any plastic material, and lies in the intercellular spaces a mere opaque liquid, partially mixed with traces of albumen, unorganizable, but not tending to as rapid decomposition as when the whole vascular contents are discharged. The *why* of this is very plain when we remember that, in cases where the capillaries are ruptured, the stasis is *complete;* while, in these just mentioned, a *partial* degree of flow is still admitted.

These extravasations usually begin in or near the center of congestion. When this occurs at any portion of the surface, it can be distinctly felt under the finger, having so separated and loosened the tissues as to give a tremulous kind of feeling. This, at first, occupies only a small space, but extends as the area of congestion extends, though not reaching the full limits of the stagnation till the latter has received a check by the fibro-plastic effusion of inflammation. When the center of congestion is some distance below the surface, and the dense, organized layer of protection intervenes between the finger and the fluid exudation of stasis, the same tremulous feeling can still be felt (though in a smothered manner) underneath the wall of more solid material. It may be likened to a bog afar off—a hollowness and softness underneath firm ground.

The stoppage of the circulation having cut off all supply of nourishment, a tendency to chemical decomposition is at once observed. Indeed, the exudation may itself be called the initiatory process of such destruction, this mode of departure of the fluids from their vessels being the first step in the progress of decay. When the stasis is complete (and no other degree really deserves the name), the decomposition advances rapidly. The practitioner may know, therefore, that when congestion has continued long enough to allow of transfusion, decay is almost a certainty; and the existence of a tremulous center is a very reliable evidence of approaching destruction. But while, on the one hand, this chemical waste of tissue never occurs till the circulation is more or less completely cut off, it may happen, on the other hand, that partial cessation of flow, and consequent exudation, may exist for some time, and yet the vital principle retain a sufficient hold upon the structures to keep the chemical laws in abeyance. This is more generally the case where the obstructions are not of foreign introduction, but have an internal origin; and, even then, there is such a close balance between life and death, that a straw may at any moment turn the scale in favor of the latter, when decomposition will be rapid and extensive.

But, as we have already seen, the exudation which takes place in those parts where the inflammatory action is going on, partakes more of the character of a vital secretion than a passive transudation. The fibrin and lymph of the blood, not its mere watery portions, are then carried out, and that without causing any rupture or injury to the capillary vessels. The vital power, too, retains its hold over the materials and builds them up into a firm, dense wall, instead of allowing them to pass into chemical decomposition. And, after a time, this wall becomes permeated by a few very small blood vessels, which give it further life and vigor. When the system is strong, the constitution unbroken and the blood free from all unwholesome materials, this plastic exudation will be very firm. When the system is feeble, the general health impaired, and the blood of an innutritious quality (being loaded with retained elements of secretion, or degenerated by some noxious absorption), no such organized dyke is formed, or a very meager one at most. And all medical authors have observed, that, in the former class of cases, the danger is limited, even though the inflammatory effort is of the highest possible grade; whereas, in the latter class of cases, the inflammatory effort being of a feeble quality, the danger is greatly increased. The reason is obvious. The ardent inflammation, sustained by a sound body and aided by wholesome blood, raises up a lymph barrier against the advancement of destruction, so that, when the congested portions have passed into decay for want of nourishment, the contiguous living tissues may be able to repel all threatened encroachments of the virus. But when the local exertion, having no support in a feeble constitution, or finding no resources in the impure blood, makes an abortive attempt to raise such a dyke, the poison of putrefied tissues meets no resistance and travels onward at pleasure, carrying destruction at every step. Yet surgical writers would convey the idea that the inflammation favors this destruction, even while they themselves record the observations of the resisting power of the fibro-plastic wall—the only direct and actual product of the increased local circulation. Such a contradiction and perversion of facts should no longer be allowed to influence the minds of students and practitioners, but the conclusions should correspond with the realities of the observations, namely: That inflammation raises the wall of coagulable lymph for protective ends; that, when the arterial effort is capable of building up such a wall, the danger to be apprehended is light; but, when no dyke can be made, a spreading tremulousness being presented to the feeling, the danger is increased and the probabilities of extensive destruction are imminent.

While, therefore, the surgeon dreads the liquid exudation of congestion, he prizes and favors the lymphy transfusion of inflammation, being always pleased when he meets it largely developed. In the healing of wounds, uniting of fractures and reparation of abscesses and ulcers, no progress can be made without this vital effusion: and in bruises, carbuncles and erysipelas, the practitioner is but too happy if he can secure such an out-pouring of plastic matter. Yet, when the effusion occurs in some narrow passage, or upon some very vital organ (as in the larynx and upon the brain), great fear is to be apprehended lest the occlusion in the one case, and the pressure in the other, may lead to the most serious results. The protective design of the exudation, however, is not altered by these differences of position, and the alarm which may be felt is not to dictate a course of management that shall thwart the ability to form a plastic barrier, but rather urges to the most prompt removal of the obstruction which made a necessity for both inflammation and transfusion and which constitutes the real difficulty.

Besides answering the purpose of a vital barrier against the spread of poison from decaying structures, this fibro-plastic exudation serves as a support and stay to the capillaries, preventing their over-distension and consequent atony. This is more particularly seen in the looser structures, as muscles, skin and mucous membrane. But in the more dense parts, as bone and tendon, this effusion may become an impediment to free circulation; for these tissues are so unyielding that, instead of giving way before a large exudation of lymph and fibrin, they force it back upon the more pliant blood vessels, narrowing their channel and interfering with the flow of the fluid.

PAIN.—Pain, as we have elsewhere shown, is but a vital manifestation—an exaltation of the sense of feeling. This increase of sensation is more or less constantly an accompaniment of inflammatory effort. When the difficulty consists in the introduction of some foreign solid, the consequent laceration of nerves causes suffering from the first. If the impediment to arterial flow consists in uneliminated elements of secretion, no special elevation of sensibility may be perceived till the recuperative effort is established. The increased afflux of arterial blood then arouses the function of the nervous peripheries and a decided tingling and smarting are felt. As the blood accumulates, the pressure further increases the suffering and the sensation becomes so acute as to amount to an actual pain, which, on some occasions, is almost unbearably severe. When the exudation takes place, the intensity of the pain is still further increased, keeping exact pace with the addition of each degree of the burden. In the denser structures, where the rigidity of the tissues causes such a marked reaction of pressure against the softer organizations, the acute suffering of the sensory function is much greater than is observed under a corresponding amount of exudation in more open and yielding parts. The profusion of sensory nerves in a part also determines the amount of pain—tissues that are sparsely supplied being but little affected, while those abundantly furnished suffer most intensely, even upon trivial occasions. The sensation, too, may be said to oscillate at each vibration of the pulse, every new arterial momentum adding to the pressure and pain, the succeeding relaxation relieving the sensory peripheries of a portion of their burden and suffering.

Mere mechanical pressure, however, is not the only requisite for the production of pain—there must be a functional ability of response, otherwise no acute suffering will be felt. Practitioners are familiar with the fact, that pain is nearly, or entirely, absent in anasarca, ascites and other dropsies; also in many cases of large tumor, and in the center of some dark and congested abscesses where liquid exudation is very great. It is noticeable, in all such cases, that the sensory function is more or less completely in abeyance, and an active, or even a normal circulation, does not exist. As a consequence, the nerves cannot take any cognizance, or give any warning, of the existing pressure. A constant remembrance of these facts is necessary to a true understanding, both of the cause and design of the acute suffering of inflamed parts. We have elsewhere maintained the opinion that all pain is physiological, vital and intended for the good of the system. The correctness of this opinion is remarkably illustrated in all cases of inflammation. In the first place, the presence of the material which acts as an obstacle to free circulation, makes an impression upon the nerves, which impression excites to arterial determination. The arrival of more blood is both a new pressure and a new excitant, leading to increased sensation, and this, in turn, to increased action; and thus feeling and action reflect each other till an ardent inflammation is established. It is evident that, if the nerves of the injured part had so lost their functional capacity as to be incapable of responding to the impression made by the violence, no inflammation would have been set up. Without inflammation, no plastic exudation would have been thrown out, the blood would have become stagnant and the tissues rotted without any vital effort at prevention; for it is well known to all medical observers, that when a part is so insensible as to be unable to make any response to an injurious impression—or if it has made such a response, excited an inflammatory exertion and then ceased to feel—chemical decomposition is an inevitable consequence, unless medication can be made to speedily excite it to sensation, and even to actual pain.

Pain, therefore, is a vital manifestation of the greatest importance as connected with inflammation, the degree of it determining the amount of vital resistance being made to the encroachments of disease. Let it not be understood, however, that the creation of more pain is an end to be sought by the practitioner; for, while neither sensation nor action is itself disease, yet the intensity of each is a very reliable witness of the amount of danger that threatens the structures, and hence an evidence of the energy with which the surgeon should seek to remove the obstructions and do away with the necessity for such excessive feeling and arterial exertion. This will be more apparent in those cases where the pain is of a distinctly throbbing character—increasing with marked violence at each pulsation. Such feelings only occur at times when, and about points where, congestion has just taken place and caused complete stoppage in the onward flow. We know that when such stasis occurs, the portions congested are about to pass into decomposition. If our view of the recuperative nature of inflammation is correct, then we should expect that, the danger being increased, the arterial effort would be correspondingly augmented. And this is literally the case, the local arteries beginning, at that moment, to beat with such great violence as to cause distinct throbbing—not, perhaps, always visible to the eye of the practitioner, but most distinctly cognizable to the nerves of the patient. Whenever, therefore, pain of this form is complained of, destruction of some degree may be anticipated.

But besides redness, heat, swelling and pain, a very marked local, and oftentimes general, disturbance of function attends inflammatory action. In the milder grades of local arterial effort, secreting surfaces and organs have their functions increased, apparently with the idea or intention of thereby washing away the offending substance. We say "idea or intention," because we suppose there is a dumb intelligence (or instinct) in the vital force, which leads it to make all the resisting efforts with as much *design* as is apparent in contractions of the heart, or in the passage of chyme through the pyloric orifice. Failing in the attempt to remove the obstruction by an increase of secretion, there seems to be a diversion of effort, all the labor being expended in an endeavor to build up a fibrinous wall and thereby protect the surrounding tissues from the danger of the decomposition which threatens them. The mildest means are employed first and the most potent and effectual resorted to after those have been found insufficient. The process of local secretion is, therefore, usually left unperformed after the inflammatory action becomes more ardent, being of less immediate importance than the resistance to decay. In congested parts, all secretory action is, of course, suspended. When the obstruction is so considerable that the general circulation is called in to aid the local effort, there is usually a partial failure in most or all the secretions, as of the skin, stomach, kidneys, &c. This seems to be in consequence of deficiency of vital energy in these organs—this power, along with its great instrument, the blood, having accumulated at and upon the threatened localities. After the obstacle to harmonious action has been removed, and no further necessity for inflammatory effort exists, the secretory functions are gradually restored. Sometimes, however, the part threatened never fully recovers its vigor, the semi-stagnation which existed through it having made it feeble and liable to new forms of disease upon trifling occasions.

PROVOKING CAUSES.—Inflammation, being a vital act, has but one *producing* cause, namely, the life power or vital principle. But the occasions and influences which may *provoke*, or make a necessity for, this resisting effort, are multitudinous. Indeed, anything which, in any degree, under any circumstances, or in any form, can interfere with the harmonious play of the tissues and the free passage of blood through all parts of the body, may make a necessity for, or become an exciting cause of, inflammatory effort; for, as long as the living principle has full control over the structures, it will make every exertion to repel all influences that may interfere with its operations. It needs but a moment's thought to convey to the mind an idea of the almost limitless number of forms in which such influences may be met. The more prominent of them may be conveniently classed under a few general heads: 1st. *Lodgment of solid bodies*, as wood, stone and glass, introduced externally, and spiculæ of bone and calculi, formed internally. 2d. *Wounds*, *bruises* and other mechanical injuries, which, whether they cause a severance of tissue or but a simple contusion, are not cured without some grade of inflammatory effort. In this class are to be enumerated simple incisions, amputations and all surgical operations requiring the use of the knife, and abrasion by caustics, burn, scald, &c. 3d. *Pressure*, which is a very fruitful source of difficulty, always making occasion for vital resistance and liable to be so increased (even by the surgeon in the application of his bandages) as to produce congestion and lead to actual decomposition. 4th. *Cold*, which, by acting excessively upon a part, causes such injury to the tissues as to threaten their destruction and make a necessity for arterial preservation—as is seen in chilblains and frost-bites. The extensive application of cold to the surface causes heavy accumulations of blood upon the internal organism, which may injure the vessels by pressure, or by partial stagnation, and become an occasion for inflammatory resistance. Such cases, however, are most frequently met with in medical practice, in the form of pneumonia, pleurisy, peritonitis, &c. 5th. *Retained secretions.* Every secretion of the body, by accumulating either in the organ by which it should be eliminated or on any other portion of the system, will prove a most active provocative of inflammation—as is witnessed in hepatitis from retained bile, cystitis from retained urine, peritonitis from suppressed lochia, dysentery from unvoided feces, &c. 6th. *Excoriating discharges*, as pus and the ichor of abscesses and the virus of gonorrhea.

Many constitutions, and different conditions of the same constitution, have a strong predisposition to ardent inflammatory exertion. Thus, plethoric persons, and those who are of an extremely excitable tendency, will resist even the most trifling injuries with the most ardent circulatory effort.

EXTENSION AND DURATION.—The extent of surface that may be engaged in an inflammatory effort, will vary according to the circumstances under which the action is established. The size of the obstruction usually determines the latitude of arterial excitement—limited impediments needing but a narrow circle of effort for their rejection, while larger ones may make a demand for the expulsive labor of the whole system. Yet, even small obstacles may prove a center for extensive destruction and correspondingly extensive inflammation; for, when the frame is debilitated and the blood impoverished, there may not be sufficient vital capacity to build up a lymph barrier against the products of decay. As a consequence, the living tissues are left unprotected against the contamination of the decomposed structures, layer by layer of the sound integument yields to the morbific influence of the putrefying granules and what was at first an insignificant matter may shortly come to occupy a dangerously extensive space. As the process of destruction advances by these slow degrees, the vital power will continue its efforts at resistance, however vain they may be; and the circle of the inflammatory action will thus keep step with the march of disintegration, till the life principle can no longer retain its hold over the tissues, but leaves the whole body to sink into decay. This gradual extension of decay, and corresponding vital resistance, will be further considered under the head of Ulceration.

But there are occasions upon which this progress over space is not thus slowly accomplished, the vital force being incapable of building up any wall of protection around the threatened parts. This particularly occurs in those cases where the plastic quality of the blood is destroyed by certain viri, when the very effusion (which, under more favorable circumstances, would have been organized) becomes a source of still greater mischief—being so liquid as to spread rapidly among the intercellular spaces, and putrefying so speedily as to carry death over extensive surfaces with incredible swiftness. Erysipelas offers an instance of this kind, a few hours being sometimes sufficient to endanger life by the extent of the destructions—the vital effort continuing most ardently, but proving futile for want of proper fibro-plastic elements out of which to form a protective barrier.

Foreign viri, as the gonorrheal and syphilitic, may be introduced to a portion of the system, making a necessity for inflammatory action, and, by breaking down successive layers of tissue, may become the occasion of enlarging the area of vital effort to a considerable extent. They may be absorbed into the system and lodged either in organs contiguous to the point at which they entered, or in remote structures, becoming new points of obstruction and making new occasions for the establishment of arterial excitement. The whole constitution may finally be involved and a *general* inflammation—fever—then set up.

It will be seen, therefore, that the space occupied in the vital effort of inflammation depends entirely upon the nature, bulk and extension of the provoking causes; for, as long as the living power has any hold upon the animal fabric, it will resist the encroachments of chemical power and battle each and every line of ground over which the latter may advance. If the chemical force gains repeated mastery, the area of action is widened; if the vital power prevails, the limits are narrowed, and, finally, (the danger having been overcome) the exertion will cease and everything proceed with usual harmony.

The time occupied in these struggles will depend upon the same conditions. If the vital force is vigorous and the threatened danger considerable, the resisting effort will be of the most intense and positive kind, and the war will terminate either in favor of chemical or vital force in a comparatively short space of time. If the constitution is feeble, the struggle may be kept up for weeks, months and even years: the life principle is not able to gain upon the process of decay, which destroys each new layer of granules as it is thrown out; the chemical power is incapable of completely overcoming the vital force, which builds up a new lamina of fibrin as soon as an old one is destroyed. In the one case the inflammatory action is said to be *acute*, in the other *chronic*, technicalities which are wholly arbitrary, there being every conceivable grade between the two extremes.

TERMINATIONS.—Arterial excitement cannot be properly discussed if separated from the conditions which make a necessity for it; hence, as the reader will have seen, we have constantly treated of action and inaction—flow and stasis—inflammation and congestion—as they are found associated with one another. This association or commingling of the two must not be forgotten for a moment, whether the subject is considered in a philosophical or a practical point of view. The only way of investigating a subject so as to arrive at a complete understanding of it, is to study it in its relations to its surroundings. As inflammation is never established except upon the existence of some impediment to free action, and as that impediment almost invariably causes some degree of stagnation, a correct appreciation of the former is to be obtained only by examining it in connection with the latter—carefully appropriating to each the symptoms, purposes and terminations which belong to it. We have seen that congestion and inflammation are opposite *things;* and a natural inference is, that they will exert opposite influences and produce opposite results. Yet nearly all medical authors confound them, calling each the other—at one time describing stasis as inflammation and action as congestion, at another time calling congestion a nullity and counting inflammation as both a stoppage and flow of the blood. With such confusion in words and definitions, it is not to be wondered at that Paget should say he was not in a position to "define inflammation in any set terms," or Watson aver that "we know not what it is." Nor can we wonder that they have committed the absurdity of calling inflammation both a saver and destroyer of the animal frame, and should attribute to it both the building up and pulling down of the human structures.

Referring to the definitions of inflammation and congestion which were given at the commencement of this chapter, and which we have sought to illustrate, we come now more directly to a consideration of the *terminations* of each. These terminations have already been pretty clearly foreshadowed; and, from what has been said, the student might easily distinguish between the results that belonged to each and never be led into the error of confounding the one with the other. Yet, the sophistries and plausibilities of medical reasoning are so bewitching, and Allopathic views, both of inflammation and its terminations, have become so rooted in the popular mind, that we deem it best to make a still further examination of the results properly belonging to it, in contradistinction from those which follow congestion, and, by thus placing them in their true relations, prevent all confusion in the after parts of this work.

One of the most familiar surgical cases upon which inflammation is established, is that of simple incision or wound, where the integuments are directly severed by an instrument which slightly lacerates and bruises them. A smarting pain, determination of blood to the part, redness, effusion of lymph and fibrin, swelling and further increase of pain, will soon be observed. An inflammation exists: the lymph and fibrin that were effused shortly assume a gelatinous consistence. This jelly finds its way to the surfaces of the separated tissues and there begins to be formed into a soft fibrous network. All the intercellular spaces are filled by this effusion, which regularly advances from a fluid to a fibrous condition, forms a loose texture and may then be called a living structure. As yet, however, it has no blood vessels in it; but these soon appear, when the mass is truly vascularized and becomes a tissue. If the part injured is the skin, all the peculiarities of cutaneous structure (as relates to its consistence, its arrangement and the distribution of its nerves and blood vessels) will be developed in the plastic substance: the two edges of the wound will be brought together and held in contact by the newly made fibers, and the injury will soon be repaired and the opening closed up. But, if the wound is a gaping one, the surfaces being so separated that the fibers cannot extend from the one to the other, a granular layer of the lymph will be formed at its bottom and against its sides. This layer soon becomes quite firm, and then a new one rises upon it. In this manner the process continues till the whole cavity is filled with the granulated effusion, which becomes firmly organized and completely repairs the injury. In like manner, if the severed part is a muscle, a tendon or a mucous membrane, the material effused assumes nearly the same structure and proceeds to heal up the wound in precisely the same way. When the wound is repaired, the effusion of lymph ceases, the inflammatory excitement abates, the swelling gradually disappears and the redness dies away. The work of reparation has been accomplished by the legitimate process—a flow of blood through the circulatory apparatus. The amount of nutriment needed was greater than where no abrasion existed, and hence more blood accumulated upon the part. This constitutes inflammation, and *no reparation whatever* can be accomplished by any other means or in any other mode. The inevitable conclusion from the observance of these facts, is that the effusion of lymph and the formation of that lymph into new tissue, are the designs of the sanguineous accumulation; and the return of the blood to its customary channels is an evidence that these intentions have been accomplished.

Another illustration, of a more complex nature, may be had in a case where a foreign solid, as a splinter of wood, has been introduced into the soft structures. Pain is felt, the material is an impediment to a free flow, and the blood in the immediate capillaries is seen to oscillate and soon to come to a complete stand. The dimensions of the obstruction are thus increased, and the impression being now conveyed further toward the spine by the afferent nerves, an increased supply of blood is seen to hasten to the part; lymph and fibrin are effused; swelling ensues; redness is visible and stinging pain is felt. The effusion is quite fluid and settles down into every space unoccupied by structures; soon becomes more solid and then quite firm; may be permeated by a few blood vessels, but does not become actually organized into a tissue, for there has not yet been any open wound to require a new formation. If, now, the splinter is removed, the cavity that is left will be filled up as in the case of the wound, the swelling and redness will gradually disappear and the part will soon exhibit all its normal conditions. But, if the splinter is allowed to remain, the circle of congestion gradually increases around it; a purple hue is observed along its course; softening commences through this space, while the plastic layer beyond it becomes harder; all the portions which were of a purple color next turn white and are said to have festered; the skin opens and the splinter comes out with the fluid, a cavity being left behind. The inflammatory action continues till this cavity is properly built up with the fibro-plastic exudation, and then subsides as before. In this case, the splinter was the immediate or provoking cause of congestion; congestion cut off a supply of blood, and, hence, of nourishment; the parts thus deprived of vitality decayed, formed pus and were cast out; the arterial action had formed a firm dyke around the decaying part, so that none of the pus could possibly be absorbed into the system to become a source of detriment to any other part; and then the same inflammatory action molded a further exudation into new tissue, filled up the cavity therewith, absorbed the fibrinous wall into the current of the circulation, and, having accomplished its purpose, subsided.

Both these examples are familiar to every practitioner, and serve to illustrate the whole subject under consideration. Reparation is immediately and always dependent upon inflammatory action: destruction is consequent upon congestion or obstruction of circulation and nutrition. When a part is destroyed, the inflammatory effort first casts it off, and then proceeds to build up the abrasion. This is true of inflammation and congestion in whatever degree they may exist, or under whatever circumstances they may be found. Destruction may take place without any apparent congestion (as when caustic is applied to a part), but the continuance of stasis will invariably lead to structural disintegration. No reparation, however, will ever take place without some degree of arterial excitement, and every grade of such excitement tends as much to the preservation and restoration of a part as in the mild cases just adduced. This might be at once concluded upon the premise, that, being always the same thing, it works always for the same end, changing neither its nature nor design by the greatness or smallness, ardor or mildness, of its degree. The fact of its frequent failure to repair lesions and resist invasions does not prove that it *caused* either the one or the other, but simply that the chemical laws in such cases obtained the supremacy over the vital force.

Those who hold opinions different from our own, may say we are inclined to evade the proposition that *high* grades of inflammation cause suppuration, ulceration and gangrene, and that we are disposed to pass this question by with a meager show of reasoning. This is not the case; hence, we will proceed to prove the erroneousness of this ancient belief, and to establish the counter proposition that the above grades of destruction can never result from inflammatory action as a *cause*, however closely they may be connected with, or preceded by, vital excitement.

1st. It is logically incorrect to say that both destruction and reparation can result from the same influence—that life and death can come from the same power. We recognize the contractions of the heart, arteries, capillaries and veins, as vital actions. If vital once, they are vital always, whether performed faster or slower than a given standard. We recognize the making of new tissue as a vital act; but the destruction of tissue is death, or the result of disease leading to death. It must, therefore, be opposed to life. To say that that which causes the existence of life will also, and at the same time, cause the triumph of death over life, is to make two opposites agree and to reconcile two contradictions—which are no more possibilities in medical than geometrical science. As inflammation consists in increased local excitement, it is a distinct vital action *differing from* the processes of death, and, therefore, *opposed to* the production of pus, slough and sphacelus, which are but different degrees of local death.

2d. Death of a part is most rapid where the obliteration of circulation is most complete. Where a little circulation is admitted, destruction is slow; where none is admitted, decomposition is rapid and total. If a cord is wrapped closely around a finger through its whole length, the tissues will ultimately rot away; if the artery leading to the same finger is tied tightly, the flesh begins to putrefy at once. The more completely we cut off circulation, the speedier is the death; the nearer we approach a natural flow, the more we diminish the probability of destruction. Inflammation (which is a decided *increase* of local excitement) must, therefore, be a positive opponent to every form and degree of decay.

3d. Destruction of tissue is a purely chemical process—the power of chemical affinity separating the elements which the life principle had formed into animal structures and resolving them into their simpler forms in accordance with the laws of that science. If decomposition of the body could once result from vital action, or be in any way caused by the vital force, then *all* decomposition should be found resulting from the same force. But we observe that total putrefaction or mortification takes place only after the disseverance of the vital force from the body, and hence after the cessation of inflammation and all other vital acts. It is proper, therefore, to conclude, that mortification (and all other degrees of decay) can occur only after the life power has given up its hold upon the structures. But if, on the other hand, it is still contended that an increase of vital action in a part inclines it to decomposition, and that the higher the grade of living effort the greater the destruction caused by it, then a parity of reasoning would lead us to conclude that the mortification of the tomb is the immediate result of intense sepulchral inflammation!

MANAGEMENT.—Being an unmistakable evidence of the existence of some morbid condition, inflammation calls loudly for treatment; not for treatment calculated to destroy it and cast it out, as though it were disease—for that would be to essay the removal of the vital force itself—but that which will tend to the removal of the obstacles which constitute both the disease and the danger. The displacement of these is the only thing that will restore the part to a natural state and allow the subsidence of the inflammation. And, as the local excitement is a vital demonstration against disease, every remedial measure employed should be of a character calculated to promote this same object—to aid and assist the inflammation in its wholesome effort and to further the object it is endeavoring to accomplish.

Three things require to be done for the relief of an obstructed part where an inflammatory action has been set up. 1st. Relax the tissues and remove all the solid materials which act as an impediment to a free flow of blood. 2d. Supply the whole system, and particularly the excited parts, with plenty of fluid, that the excess of solids may not keep up the excitement by their too close contact with the tissues. 3d. Restore an equilibrium in the circulation, that the great excess of determination may not over distend the capillaries and so close up the absorbents as to render them incapable of carrying away the surplus fluids.

1st. As inflammation is but a local fever, it not unfrequently happens that the whole system is more or less concerned in making an occasion for its development. The obstructions to healthy action are sometimes nothing more than the elements of some retained secretion which, getting caught in the capillary meshes of some part, become the center of further accumulations and finally form a complete barrier to the flow of blood. Or, some foreign solid may have been lodged in the tissues and there acts as a barricade, preventing the passage of morbific materials which might otherwise have continued to roll by unchecked. In this way a double hinderance is placed in the way of harmonious action. Or, in still other cases, such foreign mechanical obstacles may exist for some time, becoming, in themselves, a sufficient occasion for considerable vital exertion, and yet the general circulation may be in such a healthy state that no morbific material will be lodged at the point of obstruction. But, if this dam is allowed to remain, the whole secernent organism will be more or less impaired in consequence of the diversion of vital force from thence to the more immediate seat of danger. As a consequence, elements of various secretions will remain uneliminated, lodge around the original mechanical impediment, as in the other cases, and thus become a source of the most persistent annoyance.

That all and every foreign and tangible solid should be removed at the earliest moment, is self evident—for no health can be expected in any case where such materials are allowed to remain. But the anticipation and expulsion of the solids of retention, are points in the treatment too commonly overlooked by surgical practitioners. The great importance of paying the most strict attention to them, will, however, be seen at once, when the highly deleterious character of such materials is called to mind. The number of inflammatory cases which are *said* to arise *idiopathically*, or without a cause, will also impress upon us the necessity of being alive to the presence of these accumulations; for, as no such case ever existed, to make a class of "idiopathic inflammations" is to give witness of the loose manner in which medical men observe and speak. Nothing exists without a cause; and inflammation, though its *producing* cause is always vital, must yet have a *provoking* cause in some form of obstruction. Where no foreign solid can be discovered, and the case is one not very clearly resulting from sanguineous accumulations produced by cold, the retention and lodgment of morbific material of an internal origin may be most confidently suspected to exist at the bottom of the whole mischief. And when a palpable and foreign solid is the chief source of difficulty and failure of secretion and consequent morbific accumulation are but secondary, the most careful attention must still be paid to the removal of the latter; for they may, in the first place, so impair the quality of the blood that an efficient lymph barrier cannot be raised for the protection of the healthy parts against the products of decomposition—and, in the second, disable the vital force from repairing the injury after the offending solid has been cast off and rather leave an ugly ulcer unhealed because of the deteriorated quality of the vital fluid.

The larger mechanical obstructions are to be removed by an operation; absorbed viri and accumulated elements of secretion are to be helped out, by the use of relaxing secernants, and every means that will loosen and keep open *all* the emunctories is to be energetically employed. Not an organ should be allowed to fail or a function suffered to remain unperformed, but all must be kept free and active—those which are most inclined to fail receiving particular attention.

2d. We have already remarked that the passage of the liquor sanguinis and retention, in the capillaries, of corpuscles and other solids, leave a feeling of dryness. The stagnation also admits an actual evaporation of fluid and allows the solids to come in irritating contact with the capillary walls, thus further increasing the feeling of uneasiness and exciting the blood vessels to an exhausting activity. This deficiency of fluid helps to cause a very disagreeable feeling of heat in the part, leads to general thirst and, by becoming a cause of corpuscular adhesions within the capillaries, increases the danger of decomposition. For these reasons, therefore, a free and prompt supply of water must be directed. This great natural lubricant will prevent over excitement, and consequent exhaustion, of the vascular apparatus, relieve the pain, suffering and intense feeling of heat by abstracting the excess of caloric, and save the patient from much of the annoyance, worriment and prostration which he would otherwise suffer. By combining relaxing medicines with the water, the blood and solids in the capillaries will be diluted and softened and the tissues so loosened that these materials will be better able to pass through the narrowed venous radicles. These means also keep the corpuscles from forming, with each other, those close and semi-organized adhesions which cause the almost total occlusion of the capillary tubes.

3d. Where both the fluids and solids are not carried away from the part as rapidly as they are conveyed to it, the area of congestion at once begins to widen. This failure of the absorbents is a direct cause of retention of the corpuscles and over distention of the blood vessels. As long as the absorbents are capable of performing their function, they prevent surplus accumulations and maintain a free flow of blood through the parts. Under these circumstances a mild inflammatory exertion may be kept up for some time and yet congestion of any degree prevented; for the open absorbents can carry off the floating causes of obstruction as fast as they accumulate, and no obstruction of the venous radicles will take place. But, when these vessels are closed up by pressure (in the manner already described), stagnation soon follows—the amount of material sent to the part being greater than what is taken away from it. It is a point of great importance, therefore, to relieve these occlusions at the earliest moment, as the space occupied by congestion will thereby be limited and the danger of extensive chemical destruction proportionably lessened. The means and processes which have been mentioned under the previous indications will be found efficient for this end. Those means are to be used in such a way as to secure a thorough relaxing influence, thereby loosening the absorbent structures and enlarging their caliber—a condition which secures their free action and, therefore, the accomplishment of the object sought. It may be thought that the treatment which would relax the absorbents would also further relax the already distended capillaries. But this is not the case; for the vital force is already trying to narrow the latter and enlarge the former and will direct the relaxing appliances at its will, causing all their influence to be expended upon the absorbents where they are so much needed. This is a therapeutic fact of the greatest practical importance, and instances of the operation of this law are met with in hundreds of cases of ordinary practice. In the instance before us, an application of tepid water will be followed by gradual loosening of the absorbents, the intelligence of the life principle recognizing it as a friend to the obstructed vessels and employing it for the purpose of relieving them; but the capillaries will not be softened, the relaxing influence not being needed there and hence being directed from them. If the tepid application is employed till the absorbents are sufficiently loosened to allow the free passage of fluids through them, its further continuance will serve to loosen all the vessels alike—a point beyond which no relaxant should ever be carried.

Relaxants alone, therefore, are not always sufficient, but stimulants in combination with them will often be required—the former maintaining a proper diameter of the capillaries and the latter enabling them to keep up their contractions, thereby preventing the blood from stopping in consequence of the mere atony of venous and arterial over distension.

When obstruction with ardent inflammatory action exist externally, applications can be made directly upon the part. These may consist of tepid or cold water—flannels, several layers of muslin or some of the cotton batting of the stores, being wetted and laid on. Tepid water, at a temperature of about 67° or 72° Fahrenheit, is usually the best—being sufficient to abstract the heat, because it is below the temperature of the inflamed part, while it contains sufficient moist warmth to loosen the absorbents. The water, too, is absorbed more rapidly at this temperature, perhaps, than at any other. Cold water, of a temperature of about 45°, is the most useful in some cases, abstracting the excessive heat very rapidly at the same time that it supplies the structures with fluid. Cold applications are most fitting when the redness is of a high scarlet, the pain of a smarting character and the inflammatory effort but newly established. This low temperature then acts as a stay or tonic to the arterial capillaries, maintaining their contractions and not permitting them to give way so readily before the pressure of the determination. In endeavoring to determine what degree of warmth to use in a given case, it is a good plan to consult the feelings of the patient and employ that temperature which is most agreeable to him; for the sick man's feelings are a pretty good guide and will often give the most reliable information concerning what degree of caloric is most beneficial. An explanation, however, must be introduced here, namely, that this rule is only to be followed when water alone is employed.

Whichever temperature of water dressing may be employed, it is always highly important to renew them frequently; for cold water soon becomes tepid and tepid decidedly warm. In very acute cases the cloths or flannels should be changed as often as every eight or ten minutes, lengthening the time as the warmth of the part lowers; for then the water will not absorb as much heat as before and its temperature will more slowly approximate that of the inflamed surface. Irrigation is much employed by modern surgeons and with good effect, though probably the advantages of this mode of water dressing are somewhat exaggerated. The procedure is to place the afflicted portion over some suitable vessel, if it is an extremity, or upon some oiled surface, if it is any other part of the body, and then have a person stand by the patient's side, and, dipping a large sponge in water of the desired temperature, cause it to ooze out gradually and constantly upon cloths wrapped around the inflamed portion. The close attention of the nurse may be saved by swinging above the patient a vessel partly filled with water, one end of a piece of soft crash dipping into the water and the other end hanging down upon the outside and below the bottom of the vessel. The common law of physics will carry the water up the first end of the cloth and down the other and thus a slow and constant wetting of the inflamed part will be maintained. Treatment by irrigation is particularly adapted to very severe cases, where the determination of blood seems to be inordinately disproportionate to the extent of the difficulty. It is also beneficial when congestion does not exist and a low temperature of water is most fitting.

Poultices and fomentations, however, are more frequently applied, as they may be made to combine all the advantages of any temperature of water with the influences of such judicious medicaments as the surgeon may see proper to employ. The substance of all poultices is, for the most part, composed of mucilaginous materials—as, ulmus fulva, linseed powder, althea, malva and similar demulcent agents. These materials retain their moisture for a long time, thereby keeping a part continually under the influence of fluids without the necessity of the frequent renewals that are required when water alone is used. For this reason, poultices should always be made pretty large and thick—avoiding an inconvenient bulk and weight on the one hand and not being too modestly parsimonious of material on the other. They should be mixed *well*, and made as soft as possible without risking a saturation of the wrappers and clothing around them. The temperature at which they are applied is determined by the conditions of particular cases.

Poultices of this character are themselves very largely relaxing, loosening the venous radicles and furnishing a fair supply of moisture—consequently, abstracting the excess of heat and relieving the tension and pain. They are applicable in every case and are often the only kind of dressing needed. Their loosening influence, however, can be very much increased, and their application as a relaxing means rendered many times more effectual, by the addition of powdered lobelia inflata. One part of lobelia herb to three parts of some of the demulcents, is the proportion most commonly employed; yet, when more decided relaxation is needed, the lobelia may be mixed with the demulcent (elm or linseed) in equal proportions. A still more powerfully relaxant influence is obtained by using the pulverized lobelia seeds, though the herb is usually sufficient. When the pain is acute and the patient very irritable, showing a high state of nervous excitement, the nervine relaxants may be added to the lobelia and demulcents, or to the demulcents alone. Among the best articles of this class may be mentioned nepeta cataria, mentha viridis and salvia officinalis. These, and all other agents, should be finely powdered before they are put into the form of a poultice.

When congestion exists—a portion of the surface assuming the purple or venous hue—stimulating articles should be added to the demulcents and relaxants. Cases free from congestion do not require these additions—the blood being pure, the vital force active and the arterial effort quite sufficient to maintain a circulation through parts not actually impeded by the original mechanical obstruction. But when a sustaining medical influence is needed by the capillaries, the milder or aromatic stimulants should be employed in small quantities.

Asarum, polemonium reptans, ginger and lavender leaves, may be mentioned among these; stronger stimulants being rarely, indeed we may say never, needed, unless extensive destruction threatens, when capsicum, xanthoxylum and myrrh, may be used. But as these are properly cases of ulceration, gangrene and mortification, and not simple cases of congestion with surrounding inflammation, their management will be considered under the appropriate heads.

Local medicaments may be all that are required in ordinary cases; but, where the obstructions occupy a considerable space, and where they either consist in, or exist with, the retentions consequent upon unperformed secretion, a systemic course of management must be energetically pursued in connection with the topical means already mentioned. In both these classes of cases the blood must be freely invited to all parts of the system, and especially maintained in a free flow at the surface. Drinks of a diffusively relaxing and stimulating nature should be used freely, as they sustain gentle moisture upon the skin at the same time that they furnish the body with plenty of fluids. Sage, spearmint, asarum, hyssop, balm and ginger, may be used at pleasure—always remembering to make the infusions weak enough to be perfectly palatable and to give them warm. If chilliness is felt (by no means an uncommon thing in cases of extensive obstruction), the more stimulating of these means—ginger and asarum—are to be preferred: sage and the mints are best adapted to an irritated condition of the system. The surface should also be sponged with tepid alkaline water and the bowels unloaded by enemas of a demulcent nature—not a day being allowed to pass without one free evacuation. If considerable failure of the renal secretion is noticed, galium aparine, arctium lappa seeds, or asclepias syriaca, may be used for a drink in connection with some of the above articles. Persistent costiveness, if not readily overcome by enemas, may be inferred to exist in the upper bowels and hepatic apparatus, when it should be met by the *moderate* use of leptandra, senna or any similar agent. Great foulness of the stomach may sometimes be found connected with the other functional failures, and should be treated in the same manner as when met with on other occasions—by a very thorough lobelia emetic, which not only unloads this organ but opens all the secernents and causes a complete revulsion in the operations of the system, setting everything free from the former thraldom. A vapor bath, followed by friction, should always be given after an emetic; for it is the most effectual means that can possibly be used for clearing out the morbific materials which lodge between the skin and alvine canal. These drinks, clysters and baths, are to be persevered in energetically till all obstructions have been removed and the blood again flows freely and without interruption.

When injuries, obstructions and morbific accumulations, exist internally—making a necessity for inflammation among the deep seated organs, and yet constituting a surgical case—the treatment mentioned in the last paragraph is to be relied on. Nearly all cases of this kind, however, belong to medical practice, and only a very few (as intestinal and gunshot wounds, and strangulated hernia with the operation for its relief) belong to the surgeon. When such do come under the surgeon's care, the above mentioned management, energetically pursued, is proper.

The treatment which we have thus marked out, is to be adopted in every case where inflammation occurs. As this vital act is always one and the same thing, differences of locality and variations of intensity cannot alter its nature, and, therefore, should not be allowed to change the principles of its management. What is appropriate in one degree of the exertion, will be equally appropriate in every other degree, the *amount* of medication being increased or diminished according to the severity or lightness of the obstructions to vital action. In gangrene, ulceration, suppuration, fracture, frostbites and other surgical difficulties, certain special ends are to be accomplished and a specific course of management is required to meet them; but relief to the inflammatory exertion is obtained by the same general principles in these cases as in all others, and it is only when the chemical and mechanical forces obtain supremacy over the vital power, that the treatment is to be materially modified. But these are occasions upon which the preservative and destructive powers are at war with one another, and the minute management demanded by the peculiarities of each will form the subject of the after portions of this work. What has already been said will be applicable to all cases in which inflammation is established, whether in the head, trunk or extremities; the student, therefore, should master every sentence in this chapter before proceeding further: for he is called upon to deal with and make use of this effort of the life power in every surgical case that comes before him for treatment—hence he will not be prepared to obtain a clear understanding of any coming chapter till he has made himself perfectly familiar with the subject of this one.

We cannot dismiss this topic without remarking, that, plain and simple as this mode of management may appear to be, it can, nevertheless, be relied upon with implicit confidence. It has been fully tested by hundreds of surgeons through many years of practice and has always proved as efficient as it is safe. Its novelty, when judged of by the directions of most surgical authors, may lead many to condemn it hastily and without trial; but the careful investigator and prudent practitioner will find it fully deserving of their attention—at least they should test it before setting it aside.

PART II.

PROCESSES OF DESTRUCTION.

CHAPTER I.

CONGESTION.

General View of Congestion.

THE term *Congestion* is used to define an excessive accumulation of blood upon a part, over distension of the blood vessels and a marked retardation of the flow, with diminished activity of the capillaries. It is an essential precursor of all degrees of chemical destruction, being that condition in which life and death are poised in a balance—the one triumphing as the circulation returns to its natural freedom, the other obtaining the mastery as stagnation becomes more and more complete.

CAUSES.—Any thing that can obstruct the blood vessels, or weaken their contractile power, may become a direct cause of congestion. The pressure of substances located internally or externally; the disorganizing power of heat and chemical corrosives; the depression following lacerations, bruises, shocks and capital operations, and the influence of either animal or vegetable narcotic poisons, may be enumerated as the principal classes under which nearly all causes of sanguineous obstruction may be arranged. Any of these causes may exert its deleterious influence upon a small portion of the system, when the resulting congestion is said to be *local;* or it may affect the whole circulation of a vital part, as the lungs or brain, when the difficulty becomes *general:* but these terms only define the *extent* of the difficulty, without at all affecting its *nature.*

DEVELOPMENT.—A *principle* is always most clearly illustrated by familiar examples; hence, a correct understanding of congestion can be best obtained by studying the most commonplace cases. Take, therefore, the instance of a piece of wood forced under any part of the skin. If the patient is of robust frame and in good health, the laceration of the nerves will cause sharp pain, and this is speedily followed by a rush of blood toward the part. The blood vessels are slightly distended and the surface appears a little flushed. The piece of wood proving a barrier to the onward passage of the blood that enters the capillaries it has severed, the corpuscles of this fluid crowd into these capillaries, while the more liquid portions pass around through the little vessels that are uninjured. In a few hours, or a few days (according to the nature and locality of different cases), these corpuscles will have become so closely crowded together as to completely fill and considerably distend the capillaries in which they have lodged. A further swelling of the part is then observed, and the bright arterial color gradually changes to a heavy, venous purple. The pain continues, but the nerves are somewhat blunted by the unnatural presence of venous blood, and the suffering is not acute. An inflammatory effort of resistance is now established (as was fully discussed in the last chapter of the previous Part), but cannot overcome the congestion, because it cannot directly eject the offending piece of wood. Being unable to regain the portion of tissue injured by the wood, the life power turns its whole attention to the protection of the parts that are still sound and builds up a wall of fibrinous material, as was previously described. In the meantime, the coats of the capillaries occupied by the crowded corpuscles, begin to lose their vigor—a natural and inevitable consequence of the deprivation of arterial blood. The integrity of the parts cannot be sustained, having been deprived of the only medium through which the vital power can supply them with nourishment, life and health, namely, a pure and uninterrupted circulation. The structures are now yielded into the hands of the chemical laws, which proceed to resolve them into simple elementary forms. The cell-walls of the corpuscles burst; the capillary vessels soften and pass into a pulpy state; the parenchyma decomposes gradually and adds to the volume of the decaying mass—the whole forming a thickish white fluid which will be more fully described in the next chapter. The part is then said to have "festered:" the wood and the product of decay are soon cast out upon the surface, and then the inflammatory process will proceed to close up the cavity.

It will here be seen that the parts that have decayed are the ones in which stagnation existed, while those that remained alive were the ones through which the flow of blood continued unobstructed. In the center of the stagnation, where the stoppage was complete, the death of the parts was equally complete: further from that center, where the cessation of flow was only partial, all the structures do not decay, but remain possessed of a low degree of vitality and may be fully recovered by the life power. If the wood remains imbedded a long time, however, the congestion may be extended to these latter parts, when they, too, will fall under the chemical power. If the stoppage in the circulation is complete from the first moment of the injury, the decay will begin almost immediately; but if a small degree of circulation is admitted for a time, and the occlusion of the vessels becomes complete only after the infiltration of serum, several days may elapse before decomposition commences.

Words and illustrations might be increased till a whole volume would be formed upon this subject, but one case is a type of the many. This case distinctly places congestion before destruction, and shows its terminations to be directly antipodal to the ends aimed at by inflammation. No form or degree of organic destruction can take place unless congestion of the part has previously existed—except arterial circulation and nourishment have been cut off. When the stagnation takes place slowly and gradually and is surrounded by a vigorous inflammatory effort, the decay will be limited, the products of decomposition mingled with the exudations of vitality and the lost structures readily replaced.. This form of decay is termed suppuration. When the obliteration of flow becomes suddenly complete, all the parts thus obstructed will die at once and in a mass, constituting those forms of decay known as gangrene and mortification. When the vital power is incapable of building up a firm plastic wall, but leaves the product of decay to advance from point to point and prostrate the capillary power by its depressing influence, the cases are classed as erysipelatous. When the violence of injuries and operations prostrates the nervous centers and depresses the very origin of circulatory power, congestion may be established through large regions of the body, constituting shock of injury. In like manner may congestion take place in burns, frost-bites, lacerations, wounds, bruises, fractures, varix and almost any other surgical case, thus coming before the practitioner at almost every turn he takes. Being the forerunner of destruction, it constitutes the condition which, more than any other, the surgeon learns to dread; and to successfully provide against and combat with it are among the greatest desiderata in the practice of his art. The multitude of forms, degrees and circumstances under which it will be met, will be fully discussed through the coming parts of this work. Before going further, however, let the student study the last chapter carefully and make himself master of the facts and principles it contains. Then he will be prepared to proceed to the coming chapters and will carry with him a full understanding of the preservative tendencies of inflammation and the destructive tendencies of congestion. His success will depend entirely upon the judiciousness of his attempts to overcome the latter and encourage and assist the former.

CHAPTER II.

SUPPURATION.

Suppuration in General.

SUPPURATION is that simple form of organic destruction in which the power of chemical affinity slowly obtains control over the tissues, resolves parts of them into their original elementary substances and causes them to assume the form of a degenerate fluid, which, according to its degree of putrescency, is variously denominated PUS and ICHOR.

We have already, in the chapter upon inflammation, given a correct outline of the circumstances under which this process of decomposition begins, and that chapter should be studied carefully before this one can be perfectly comprehended. In that chapter we saw that congestion or stasis of the blood, by depriving a part of its nourishment, is the foundation step in the process of destruction. The vital force, having been deprived of its hold upon the structures, yields them up to the chemical force, which immediately commences resolving them into forms and compounds governed by the affinities of chemistry instead of those of vitality. Congestion is always antecedent to chemical decomposition; for as long as a free flow of blood is admitted to a part, death will not take place. The vital force, however, generally loses its hold gradually and rather by minute degrees than at one full step. Destruction, therefore, can seldom advance in any other way than a gradual one; hence the decaying solids have time to soften, almost to liquify, and pass away little by little in this form. The lymphy effusions of inflammation mix up (during the progress of decay) with the products of decomposition, make the mass still more liquid and dilute and wash away the putrescent materials—thereby preventing them from excoriating the living parts and rendering them comparatively harmless to the sound structures with which they come in contact.

Decay of the tissues always begins in or near the center of congestion, that being the part which has been longest deprived of vital sustenance and hence the one the nearest ready for destruction. The layers of tissue which lie nearer the borders of the inflammatory effort are more tardy in decomposing, this process receiving a check as soon as the current of vital action is reached. The more complete and sudden the stasis, the more speedy and perfect will be the suppuration; and the limits to which it may extend are determined only by the resisting capacity of the vital power—in other words, by the amount of inflammation established and the healthy, firm character of the plastic exudations.

An ardent inflammatory resistance cannot always be established against the encroachments of decomposition; hence cases of suppuration will be met with where the attendant arterial excitement is of a too low grade to attract much attention. As was explained in previous chapters, the surrounding tissues are then so deficient in vitality as to be nearly under the control of chemical force and will readily pass into decay. In all such cases, line by line of the tissues breaks down, step by step the abrasion widens. The absorbents, being unsustained by the ingress of arterial blood, can not resist the presence of the poisonous product. They take it up into the adjacent tissues, thereby increasing the extent of the local disintegration and threatening the whole fabric with an introduction, to the general circulation, of this morbific material. The progress is usually slow, continuing for days, weeks and even months. The danger, however, is imminent, unless the practitioner can arouse a sufficiently strong vital effort to resist the invasion by building up a plastic dyke around the decaying portions. Whenever the vital power has any control over the structures, it will rally to the rescue of its domain and stir up some degree of resistance. The less this vital hold, the more gloomy the prospects of a given case. Yet the surgeon will find that, when an intense grade of inflammatory effort is established, the decay of the congested parts will be more rapid than in the other cases, at the same time that it is limited in its extent. This is really, in part, due to the inflammatory exertion, which cuts off the supply of nourishment to all parts which it cannot succeed in saving, thereby leaving them to more speedy destruction. It does this, as will be hereafter more fully explained, by means of the fibrinous deposit—the exudation settling down so firmly around the congested parts as to prevent all communication between them and the healthy parts. And then the vital force, like an intelligent director, further labors to cast off the enemy against which it has raised a barrier, acting upon the principle, that the sooner a threatened destroyer is removed the better for the safety of the whole system. This rapid destruction, however, is in no way attributable to the inflammation, but is, rather, a most cheering evidence of the protective efficiency of the vital power—an evidence which the surgeon ever welcomes as the best friend of the system. Decomposition is further hastened by the increased warmth and moisture which inflammation infuses into the congested part.

All the tissues of the body do not yield to the power of chemical affinity with equal readiness—those which are the most lowly organized and the furthest removed from the center of life offering the least resistance, while injuries at vital parts are more certainly and readily repaired. In the highly vascular membranes decomposition is the most rapid—as can be seen in the mucous tissues, which are destroyed much more readily than the cutaneous. The cutaneous, in turn, decay sooner than the muscular, the muscular sooner than the serous, the serous sooner than the tendinous and ligamentous, and these sooner than the osseous. In this way it not unfrequently happens that a large cavity may be excavated by the suppuration of some yielding part, while the denser structures (as arteries, ligaments and cartilages) which run through it remain wholly undestroyed.

These remarks apply with equal propriety to every grade of the destruction of tissue: whether the mildest, as suppuration—the greatest and most speedy, as mortification—or the grades between these, as ulceration and partial gangrene.

PROCESS OF DESTRUCTION—PUS.—When decay of tissue in the center of a congested structure is first observed, the part appears soft and pithy, soon loses the appearance of an organized structure, becomes pulpy and finally assumes a liquid character. At first these changes relate to only a very small part of the structures—the decay beginning at a molecular center and from thence advancing with greater or less rapidity, according to the circumstances connected with individual cases. This product of decay is usually of a muddy-white appearance, sometimes quite thin, and always more or less corrosive to the tissues around.

A nucleus of decomposition having been thus established, the process of chemical disintegration gradually advances till the wall of protective lymph is reached. Here it receives a check; for, unless the fluid of the decayed structure is of an unusually corrosive quality, the plastic barrier will materially retard its progress toward the sound parts. A struggle, however, takes place at this boundary line between life and death.

The decayed elements tend to break down the vitality of the adjacent tissues and reduce them to a mass of chemical corruption. The life power seeks to protect the parts it occupies by the effusion of more lymph globules upon the surface of the plastic wall. These globules, retaining their vitality, though incapable of being organized in opposition to the influence of the corrosive elements, float among and mix with the latter, giving a yellowish tinge and a thicker consistency to the fluid and at the same time so changing it that it is much less excoriating than before. This compound fluid is known by the name of PUS and exists, in some quality, in all discharges from decayed structures, whether the form of destruction is that of an ulcerating surface or a rotting cavity (abscess).

The character and sources of this purulent discharge have long been subjects of discussion and inquiry among surgical observers. The majority of authors at the present time agree that it is a *secretion* resulting from the morbific (destructive) action going on in the part—in other words, that it is the diseased product of inflammation. But secretion is a *vital act*, and can no more be destructive in its character than inflammation can. Secretions may be diminished or increased in amount, and even become very unnatural in quality, according to the condition of the secreting organ and the nature of the circumstances influencing it. But the proposition that the absorbents destroy the tissues by taking up their particles and then casting them out in the form of purulent materials, is in such direct contradiction to all known principles of physiology, that its entertainment by learned men can be accounted for only on the supposition that, having no distinct knowledge of the subject, they have concluded to adopt this explanation rather than wait patiently till time and labor should unravel their doubts.

These questions, however, are full of interest; and as it is but right that we should offer new answers to them (since we object so decidedly to the old ones), we will at once enter into an analysis of the facts connected with the process of suppuration.

In a great majority of simple cases (for instance, a healing sore upon the surface), pus is a cream-like fluid. Its color is a whitish yellow, its consistency about that of well warmed cream, it has a glutinous feeling, mawkish-sweet smell, and a specific gravity somewhat greater than water. These appearances and characters are subject to many changes, as we shall presently see; but they exist in the greatest number of cases and hence are taken as the standard. Pus of this quality is termed *healthy* and *bland* and is found to be but slightly corrosive to the tissues, those that are sound being scarcely affected by it.

But, while these are the properties of healthy pus as seen by the unassisted eye, microscopic and chemical examinations reveal many new and interesting features. They show that this bland fluid consists of two very distinct parts: 1st, the liquid debris of the tissues; 2d, cells. The cells float in this liquid when it is in agitation, but slowly settle in it when quiet is maintained. These cells have been considered characteristic of the fluid, and writers have recorded the most minute items in the numerous observations which have been made concerning their peculiarities. They are mostly oval and smooth, though many times rounded and rough—on some occasions, quite transparent, and again quite opaque. They are usually from one-twenty-seven hundredths to one-twenty-three hundredths of an inch in diameter and remarkably like the colorless corpuscles of the blood, and all contain nuclei—sometimes one, again two, and even three being quite discernible. These nuclei sometimes fill half the cell space, at other times occupy nearly all of it; they are almost invariably found attached to the wall of the cell and present a granulated surface. "The contents of the cells," says Rokitansky (vol. i, p. 116), "are in some cases, limpid; in others, owing to very minute granulations, nebulous. It is very common to find one compact group of pus cells presenting every known gradation in the quality of their contents."

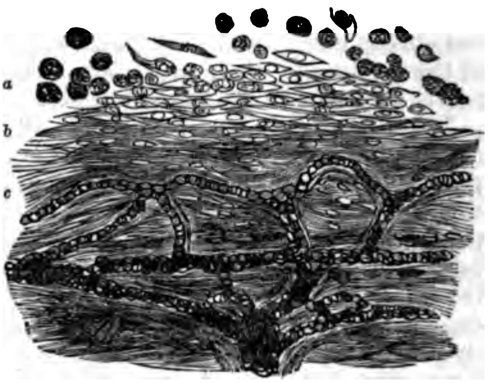
Lehmann, Vogel and others, have made numerous experiments upon pus cells and their nuclei, using acetic, hydrochloric and other acids in a dilute form, also solutions of the caustic alkalies, borax, &c. From these examinations—when compared with similar experiments made with red and white corpuscles, fibrin, albumen and other constituents of the blood—the following conclusions have been drawn (Rokitansky's Patholog. Anat., vol. i, p. 117): "1. The sheath of pus cells, turgescent in acids, soluble in solutions of caustic alkalies and of their saline conjunctions, is identical with a protein compound which may be artificially produced out of albumen, deposited by water, and redissolved by alkaline salts and acetic acid—a modified albumen, poor in salts, constituting a transition stage to fibrin. 2d. The nucleus, insoluble in acetic acid, soluble in solutions of alkalies, turgescent in solutions of salts, [is] a protein compound similar to the venous fibrin."

These pus cells are an exudation (or, if the term is preferred, a secretion) thrown out from the surface of the pyogenic membrane lining the wall of plastic material which is built up around the decaying center. They can be seen, upon microscopic examination, to be formed of the accumulation of several small granules, or molecules, which are thrown out upon the half organized surface. These molecules coalesce, become joined and form a rudimentary nucleus, from the surfaces of which are given off the materials which compose the cell wall—the whole process being really a vital growth, in every respect analogous to the living transformations of liquid plasma into rudimentary tissue as observed in the formation of the fibrinous wall. It has been asserted that this association of the molecules sometimes forms the cell wall first and the vital development of a nucleus proceeds from it; but such instances are extremely rare, and it is even doubtful whether they ever occur. All pus cells, however, do not seem to be formed by the above association of molecules, as many observations have detected molecules, nuclei and nucleolated cells, emerging together from the surface of the fibrinous wall already described. They sometimes issue almost alone, and, at other times, are surrounded by the thin fluid which constitutes the pus liquid previously mentioned. After they have remained in this liquid for a length of time (varying in different cases), their walls are observed to soften and finally burst, the contents being discharged among the liquid while the semi-protein membranes remain floating through the fluid in a corroded, yet undestroyed, state—presenting the appearance of microscopic flocculi. Finally, these membranous shreds disappear in liquefaction, thus adding to the bulk of the liquid, and their places are occupied by other cell walls newly ruptured in the same manner.

These facts prove to us, beyond all chance of doubt, that the pus cells are of vital origin and not the result of decomposing influences. Their evident albuminous character shows their analogy to the substance of membrane, and the fact of their semi-fibrinous, protein-like quality, establishes the proposition of their vitality—such forms of albumen being always the result of the formative influence of the life power. The degree of organization in pus cells is indeed low and will readily pass into decomposition; but this is by no means an evidence that their formation is due to chemical affinities, especially when we bear in mind that the laws of these affinities are seen to be constantly laboring to break these same walls down. The cells and their nuclei, it is known, come from the fibrinous or "lymphy" surface (pyogenic membrane) which was built up by the vital force and is still under the influence of the vital power, and they are never found germinating in the center of the pus liquid, nor in the body of the putrefying mass. While they retain their hold upon the surface from which they emerged, they increase in solidity as well as size and do not decay nor liquefy. When this connection is severed, they may increase their bulk by endosmosis; but this only causes their own more speedy destruction. These palpable differences in the influences exerted upon them by the living surface and the chemical fluid, are in themselves sufficient to demonstrate that these cells and their nuclei never could have had an origin in the process of decomposition.

Being, therefore, of vital origin, it is but proper to expect these cells to exert a beneficial influence; and this we find is really the case. All surgical observers are agreed, that that purulent discharge which is richest in cells is the blandest in quality—while that which has but few cells, is of a more decidedly corrosive character. The reason of this is apparent. When the cells are abundant, they modify the quality of the fluid—the bursting of their walls emptying into this fluid a semi-vital liquid which weakens its destructive quality and renders it comparatively harmless. In proportion as the cells diminish, in the same proportion does the fluid (the real product of decomposition) remain capable of exerting all the destructive influences of putrid animal virus. And when (as upon free surfaces) the product of decay is weakened and washed away by the cellular exudation, it is no longer capable of destroying the parts and finally becomes too enfeebled to injure even the cell walls. We then find these spherical bodies retaining their position upon the surface of the plastic structure from which they emerged. The granules, too, instead of coalescing to form new crops of nucleated cells, cling to the same surface. Instead of softening and bursting, they now become more solid and dense; the surface presents a granular appearance, layer after layer comes out, and in this way the abrasion is filled up, the tissues destroyed by chemical ac-

FIG. 2.



Ideal section of granulating surface, supposed to be magnified two hundred diameters: *a*, pus corpuscles, with a few nascent fibers, occupying the surface; *b*, fiber cells, of recent formation, cohering into a layer of soft tissue; *c*, fibrous tissue formed by condensation of cells and fibers, as seen at *b*, and intersected by a net-work of recently formed capillaries.

tion are replaced and the gap is *healed.* We have here, then, a mixture of the living with the dead, such as is found in the association of congestion and inflammation discussed in a previous chapter, to which we again refer the student. The *fluid* of the pus is that which really results from the chemical destruction of the tissues. The *cells* and *molecules* are vital exudations observed on the surface of the organized lymph which was cast out from the blood vessels by the inflammation, and which, in this process, evinces one of the ways in which it becomes a protector of the sound tissues beyond and a preventor of the absorption of the purulent materials. The liquid debris is that which corrodes and tends to destroy all the living parts with which it comes in contact; the *cells* and their contents modify its quality and render it more harmless: the two together make up PUS and the whole process is termed SUPPURATION.

Purulent discharges vary greatly in their character, according to the circumstances under which they have been formed. That more vital quality which was described above, is termed *healthy* or *bland pus*, the number of cells in it giving assurance that the product of decay will be so diluted as to do little injury, and then the wound will be healed up readily by the inflammatory effort.

When the debris predominates largely, the fluid is more watery and of a lighter color than bland pus, and loses the yellow tinge and oily consistency imparted by the presence of numerous cells; a granular, curdy appearance is sometimes observed, a few large cells and their ruptured walls being present. As these cells diminish in number, the discharge becomes thinner and is of a whey-like consistency. This is known as ICHOR and is extremely excoriating in its character, not only breaking down the cells, granules and nuclei as fast as they appear, but encroaching upon the fibrinous wall and corroding all the tissues with which it may come in contact.

Among the many conditions that influence the quality of purulent discharges, none is more important that that of the constitution at large. If the body is in a healthy state, every organ performing its function properly, and no recrementitious matter existing in the general circulation, the circumstances are the most favorable. The fibrinous exudation cast out by the inflammation will then be of a firm and well vitalized quality; and the molecules and cells which are exuded will be of a healthy consistency and of that composition which will most readily resist the corrosions of the debris and heal up the abrasions after decomposition has been checked. But if the constitution is feeble, several of the excretory functions badly performed and morbific materials thereby left floating the round of the system, the prospects are by no means cheering. The fibrinous deposit will then be of a low character and not of that quality which can be firmly built up into a resisting dyke. It will only be partially consolidated, and the liquid of decomposition will find its way into it and either destroy the plasma itself or break down the molecules and cells as soon as they are formed—there not being enough vital capacity to resist the encroachments of the chemical power or to speedily and soundly heal up the lesions after these encroachments have been checked.

The body at large, however, may be in a healthy condition and the local introduction of some poison may become an alarming obstacle in the way of vital resistance. Instances of this kind are found in the inoculation of syphilitic virus and the development, from contact, of phlegmonous erysipelas. The tissues are so injured by such poisons that, in many cases, no amount of inflammatory effort will be able to build up a plastic defense—the arteries and veins being left open and the structures unprotected. The parts themselves will disintegrate rapidly and the whole body will be endangered by the absorption of the poison and its conveyance through the whole system.

When the congestion and subsequent suppuration occur upon a surface, the discharge is not of such an ichorous character as when they exist in a cavity. Upon the surface, the virus of decomposition is rapidly carried away both by the effusion of cells and the washes of nurses: in a cavity it cannot be thus removed, but may lie bound in for days and weeks. Under such circumstances, pus that was at first bland will soon become harsh, then decidedly ichorous and excoriating, and finally pass into a still lower grade of putrescence, becoming most dangerously corrosive and unbearably offensive to the smell.

The kind of tissue concerned also has an influence upon the quality of the discharge and the readiness with which the destroyed portions are replaced. In mucous membranes, the process of destruction is rapid and the extent likely to be very considerable; but the discharge will be largely mixed with mucus and thereby be so diluted as to not be very excoriating. On serous membranes, the decay is by no means as rapid, but the effusion of cells is less and the pus is of a more ichorous character; the broken down material of the surface decays rapidly and speedily passes into a very excoriating fluid. Bones are destroyed with greater difficulty than any other structure, and the discharge, though not profuse, is much more corrosive than that from mucous membranes, muscles and cutaneous tissues, under the same circumstances.

In the soft structures, and oftentimes in the dense ones, the circulatory vessels may break down and allow the escape of their contents. The purulent discharge will then be more or less tinged with blood. If the case is a recent one, the color will approach scarlet or purple, according as the veins or obstructed arteries have been ruptured. The pus is then called *sanious*. If the escape of blood is considerable, exists in masses of partial coagula and gives a dark purple or brown hue to the discharge, it is termed *grumous*. In the purulent matter which escapes from cavities, it is not an uncommon thing to find a green tinge, or even a greenish brown shade; or these colors may exist only in streaks through the more purulent parts of the fluid. Such appearances are due to the putrefaction of considerable portions of tissue and occur only in cases where the impossibility of escape has of necessity led to deep destructions. The whole discharge, in such instances, is rather of a bland than an actively ichorous character.

General Considerations.—The suppurative grade of decomposition is the one most frequently met with, every tissue of the body being liable to it in a greater or less degree. When the pus collects in cavities, it is called an *abscess;* when a free surface is in a state of open suppuration, the sore is termed an *ulcer*. The destruction may occupy but a limited portion of the structures, or may spread over large portions, according to the nature and extent of the offending cause and the capacity for vital resistance. The encroachments of chemical power are greatest, all other things being equal, in persons of impaired constitutions; and feeble persons are liable to suffer from suppuration on every slight injury or even upon the performance of trifling surgical operations. In contused and gunshot wounds, suppuration is to be particularly dreaded; and persons of scrofulous or cancerous tendencies, or those afflicted with syphilitic or mercurial taints, are always in danger of extensive destruction of tissue upon very ordinary occasions. The surgeon, therefore, should be very careful how he pronounces a favorable prognosis upon such patients and should prudently withhold the use of the knife till the eleventh hour.

Large purulent formations are always exhausting to the system and a continuous discharge of pus may prostrate the strength to even an alarming degree. The danger becomes doubly great in the feeble, where deficient nervous sensibility may fail to recognize the incipient obstruction—no wall of fibrin being then formed and the product of decomposition being left to advance, unchecked, upon the structures adjacent to it. Large tracts of tissue may be thus broken down—the advance being slow and insidious, the general strength failing gradually and the life power rallying after the opportune hour for effective resistance has passed. In the more healthy, on the other hand, a distinct febrile effort will be established in all cases where the destruction is considerable—the grade of the effort always depending upon the existing vigor of the constitution. In the robust, the arterial excitement is *inflammatory;* in the weakly, it is *typhoid;* while in the previously indisposed, and in those who have suffered a long continuance of the discharge, a flickering *hectic* resistance will be manifested.

MANAGEMENT.—The surgeon's *first* duty is to avert the threatened suppuration and save the tissues from the influence of the chemical laws, as far as possible. If he succeeds but partially in this, his next aim is to limit the destruction after it has commenced; and then he is to endeavor to secure the formation of healthy granules, by which the lost structures may be speedily replaced.

1st. The event of suppuration is best averted by the use of the means and processes advised for the relief of inflammation (see page 102 to 110). This will be evident when the student recalls to his mind the facts, that obstruction to circulation is the provoking cause of inflammation and the direct cause of congestion, and that congestion always exists before suppuration takes place. That treatment, therefore, which is most efficient in relieving the system from obstructions that make a necessity for inflammation must, of course, remove the obstacles to a free circulation: to do this is to put an end to the liability to congestion, without the existence of which suppuration can not take place.

It will now be seen with how much propriety a very thorough course of medication was insisted on in the chapter upon inflammation. A tampering treatment is not justifiable in any case, particularly one of a surgical character; for every hour that the impediments to the circulation remain the danger of suppuration is increased. Let the relaxants, therefore, be administered with an unstinting hand; the vapor baths and wet-sheet packs be made thorough and searching; the secretory and excretory organs put in the condition most favorable to the free performance of their functions; and every morbific material removed from the system with all possible speed. A thorough emetic, followed by an equally thorough vapor bath, will often break up the obstructions in a few hours and place the patient out of danger. But, where the difficulty is too deeply seated for such immediate removal, the stomach must be kept perfectly sweet by the continued use of hydrastis, populus, eupatorium and other tonics, and an emetic as often as indicated; the blood must be equalized upon the surface by the frequent use of the general vapor bath; leptandra or juglans must be used to cleanse the bowels; and the affected part (all solid impediments having been removed) may be bathed with stimulating and relaxing washes, as, lobelia and capsicum in weak tincture or infusion. The relaxant, or relaxant and stimulant, aromatics should be given freely to drink; and the topical applications may be increased in stimulating power when the purple hue and dull pain of congestion are considerable. Some degree of local, as well as general, stimulation is always necessary, for the parts are not capable of sustaining themselves and require to have their acting capacity supported. The relaxants alone may be sufficient in cases where the congestion is too trifling to threaten decomposition, but they will not answer all the indications when the arterial brightness fades into a venous hue. The degree of departure from the high scarlet of inflammation always determines the power and amount of stimulus required—a little zinziber with lobelia being sufficient when the purple color is but sparsely intermixed, myrrh and capsicum with lobelia being required when the purple is predominant and pure capsicum intermixed with a demulcent being demanded when the part presents a decidedly dark venous appearance and becomes blunted in its sensibility. As these various degrees of stimuli arouse free vital action and the color gradually becomes more arterial, the quantity and power of the stimulants may be gradually lessened. Pretty stiff poultices are a good form in which to make the local applications; but an excess of moisture and warmth are to be guarded against, as they favor too great distension of the capillaries and hasten decomposition.

When the patient is very feeble, the pulse small and compressible and the nervous sensibility blunted, stimulating emetics must be used and the aromatic stimulants given to drink, as was advised in *typhoid* fever. When the pulse is large and hard, the skin flushed and the mind inclined to delirium, the thorough relaxant course of management must be adopted, as in the *inflammatory* grade of fever. Keeping in view the principles for managing the different grades of febrile effort, the student may turn to the section upon the *Treatment of Inflammation*, where he will find those directions which will prove the most efficient in aiding him to avert threatened decomposition.

2d. When slight rigors give evidence of the commencement of decay (see Abscess) measures must be taken to hasten the process of decomposition, that the parts which must die may be the more speedily cast off and the work of reparation begun the more early. The local applications may now be mostly relaxing, as, large poultices of elm and lobelia—to which a very small proportion of ginger may be added when the color of the part is a dull purple and a little capsicum if it approaches a brown or blue (see Indolent Ulcer and Gangrene). By these means the decomposition of the parts that are congested will be favored, and the thorough action stirred up in the system by the previous medication will greatly favor the ejectment of the purulent materials and hasten the establishment of a free circulation in the tissues which are yet alive. If the suppuration occurs in a cavity (abscess), instrumental aid may be required to hasten its discharge; if it is situated upon an open surface, the parts should be cleansed and treated in the manner to be hereafter mentioned under the head of Ulceration.

3d. In attempting to assist the process of granulation, the surgeon who has been active in applying the above treatment will find that he has already done half the labor devolving upon him. His baths, emetics, relaxants, aromatic stimulants and tonics, will have been so efficient in opening the emunctories and clearing away all morbific material, that the system will now be prepared freely to circulate pure blood to all the parts. These are the fundamental requisites in the process of granulation. All that will now be required is the preservation of the same hearty condition above obtained. When the bowels become torpid, the lower ones must be unloaded by an enema and the upper ones by leptandra or apocynum. Digestion and circulation must be aided by the use of tonics, such as gentiana, hydrastis, prunus, aletris and others. If the mouth tastes badly and the head aches, an emetic must be given to unload the stomach. A regular system of bathing must be pursued, but the sponge bath is to be used carefully lest too much vital heat should be abstracted from the surface—a contingency against which the practitioner cannot be too frequently cautioned when he is treating a patient in whom there is any liability to a typhoid or hectic condition. The mild vapor bath is the most powerful deterger of the skin, and is not open to the objections of the ablutions, especially when a tea of zinziber is used during the bath and thorough friction by an assistant follows it. If recrementitious materials accumulate in the system and excite a febrile effort of the typhoid grade, the treatment appropriate to the conditions indicated by that effort must be at once applied (see p. 67–71). If hectic supervenes upon the exhaustion (an event not at all unlikely in feeble persons and when the suppurative discharge is large), the appropriate treatment will be found under the head of *Hectic Fever* (p. 71). Whenever these febrile manifestations occur, the process of granulation will be much retarded for a time, but will recommence as soon as the system is cleansed and the vital force is again at liberty to rally for the restoration of the destroyed parts. In this manner is the surgeon to watch all such cases, guarding against every injurious contingency, regulating each new difficulty as it arises, preserving a free flow of blood through the whole system and surrounding his patient with all possible hygienic influences.

Abscess.

The term *abscess* is applied to a collection of purulent matter in a cavity within the substance of the organism. Collections of such material in any natural cavity (as between the pleural surfaces or in the cavity of the peritoneum), is not called an abscess, but simply a *purulent effusion*—the liquid being the result of decomposition of the exuded molecules and cells (see previous section) and not being directly formed at the expense of the membranes. Cysts, or bags of pus, are sometimes found upon the surfaces of these natural cavities, the liquid being inclosed in a membrane instead of floating at large through the cavity. Such accumulations properly belong to the class ABSCESS.

The formation of such basins of pus, by the chemical destruction of tissue, is divided into two general periods determined by the time occupied in the suppuration. Those that are developed rapidly and with local and constitutional efforts at resistance (inflammation and fever), are known as *acute* abscesses; while those that are formed slowly and without any special resistance from the vital force, are called *chronic*.

Acute Abscess.—As all tissues of the body are liable to become the seat of obstructions, so all deep parts may become the seat of abscesses. The occasions of all abscesses, or any other form of destruction, are in all respects of the same nature as those which make a necessity for inflammatory exertion. They always consist in some form of impediment lodged in the way of local circulation and which there become centers of congestion and decomposition, as was fully explained in the past sections of this chapter. In the section upon the provoking causes of inflammation, will be found a list of the several classes of these obstructions.

All abscesses, then, having their commencement in some local obstruction, the several appearances and manifestations belonging to inflammation and congestion will be observed in all acute cases. The sensory nerves of the part receive an impression of the mischief and will arouse the vascular apparatus to an effort for its removal, and thus an inflammation will be at once established. Failing to expel the offending material, the capillaries become distended, the blood stagnates in them and decay of the tissues commences. When the obstruction is considerable and the constitution vigorous, the vital resistance is of the most energetic character—the whole arterial system will be enlisted in the movement and an active fever set up. This is the case in nearly every instance of acute abscess and the febrile exertion is sometimes of the highest grade, particularly where any secreting organ is involved in the difficulty—as the liver, kidneys, &c.; or any vital structure—as the brain. In many constitutions, however, no such ardent and earnest resistance can be made, the frame being too feeble and the blood too impure to allow a high grade of opposition to the encroachments of decomposition. This failure is also more likely to occur in some tissues and localities than others; for instance, the perineum, scrotum, mucous membranes and veins, make a much less feeble resistance to impediments than is made by the skin, serous tissues, lungs and coats of the arteries. The occurrence of inflammation in those feebly vital localities and structures, is always looked upon with an anxious eye by the practitioner; for it is an evidence of obstruction in a part where extensive congestion and, consequently, the most considerable destructions are likely to take place.

The quality of the inflammatory effort in acute abscess, as in all other cases, is a reliable testimony of the degree of the impending danger. When this effort is ardent, the pain sharp and the color of a bright scarlet, a favorable opinion may be formed; for all these are evidences that a free capillary circulation is maintained, that a firm fibro-plastic wall will be thrown up, and that the present living parts are likely to be well nourished and the dead ones speedily cast off by the quantity of molecular effusion which can then be made. But if the surface presents a leaden or purple aspect and the pain is of a throbbing and heavy character, the swelling soft and the general circulation but little excited, the prospects are gloomy. Such symptoms and appearances show to the surgeon, that the capillary circulation is nearly cut off; that the vital power is insufficient to raise a healthy plastic barrier; that the living parts are not well nourished, but are ready to yield to the destroying influences of the ichor formed by the decaying portions; that this ichor is not likely either to be made into bland pus or ejected by an abundant effusion of molecules, but that it is liable to be taken up by the absorbents and carried the round of the circulation, bearing disease and death to every tissue of the frame. When obstructions, congestions and consequent liabilities to decomposition, exist in the deeper seated organs—as the liver, the substance of the stomach, the bowels, the kidneys, the uterus, &c.—there are no external appearances to aid the prognosis. The practitioner can then judge of the degree of danger only by an observance of the constitutional manifestations of resistance—an inflammatory grade of fever being much more favorable than a typhoid grade, for reasons that have been already shown.

The decomposition of tissue commences at very different periods after the accession of congestion, but the event is nearly always made known by a temporary remission of the pain in the part, followed by several slight tremors of the whole frame, after which the pain in the part becomes of the throbbing character. When the portion destroyed is of considerable extent, or the part is of a dense structure, these manifestations will be unmistakably marked: the remission will usually be sudden and distinct, giving grateful relief from the acute suffering before endured; the rigors will be sudden and sharp, appearing in a few minutes after the abatement of pain and agitating the whole body; then the blood will be driven upon the part with an intense ardor, the patient will be flushed with a feverish glow and every arterial beat will be distinctly felt at the seat of difficulty, although the pain is more dull than acute. When, on the other hand, the affected part is small, and also when it is of a loose texture, these remissions, chills and exacerbations, will be much less distinctly felt, and may be so slight and transient as to be entirely overlooked by the patient. It is very seldom, however, that they are so slight that careful questioning will not recall them to the patient's mind; and when they are clearly defined, or occur confusedly alternated with each other, the accession of suppuration may be very confidently relied upon.

The enlargement of an abscess is, in most cases, a slow process; but in cases where the constitution is feeble, the blood impure and the vital effort at resistance of a meager grade, very large excavations may be made in a very short time. Instances of this kind are found in acute, phlegmonous erysipelas, where abscesses of alarming size may be formed in from three to six days; but cases in which a more earnest and efficient inflammation is established, may require from two to three weeks for the excavation of a similar cavity.

When decomposition commences, the point of decay becomes softer and inclines quite rapidly to a fluid state. The plastic and protective wall having been built up around it, the exudation of molecules and the formation of cells at once begin and, by the constant production and liquefaction of these, the fluid in the cavity is gradually augmented and the swelling of the part proportionably increased. The surface of the plastic wall, however, is not observed to decay or waste away at first, but seems rather to distend and recede before the increasing pressure of the fluid in the cavity. It makes room by stretching—the lining of the basin not breaking into fissures, but the interspaces filling up with new exudations of coagulable lymph, which supply the means of enlargement very much as the increase of organizable material in the parenchyma of the uterus facilitates the development of that organ into a size suitable for fetal growth. In this manner the cavity of an abscess may obtain a very considerable size; but the longer the purulent material remains in it, the more corrosive does that material become. The pus cells and their contents do not decay as rapidly as does the liquid of decomposition, yet they gradually lose their ability to render the latter fluid bland by dilution. As the vital exudation thus loses its qualifying control over the chemical corrosive, the latter will exert a baneful influence upon the surface of the fibrinous wall, depressing and softening it and causing it to slowly pass into decay. In this way the size of the cavity may be greatly enlarged—actual destruction of both the sound and the auxilliary structures making more room for the purulent fluid. The abscess is now said to be actually extending itself, breaking down the barriers that were placed before it and burrowing through the tissues into the more remote parts. It sometimes traverses considerable distances, as, when it plows up the fasciæ of muscles, or when the offensive material finds its way into large absorbents and is carried along their course, even, at times, reaching the general circulation and lodging in the network of some distant organ, there to become an occasion for new vital resistance and chemical destructions. It is on these accounts that the surgeon dreads the retention of pus in the cavity of an abscess and seeks its early discharge, as will be shortly mentioned.

Fortunately, an anatomical provision is made, in nearly all localities, for the escape of the contents of abscesses. The arteries, as we know, lie deepest in the system and most remote from the surface, their ramifications and capillary divisions inclining outwardly. The capillary loops and the return, or venous, circulation lie much more superficially. By "surface," we here mean both the cuticular membrane and the lining aspect of all the natural cavities, whether mucous or serous. By far the greater number of blood vessels, however, are directed from the center toward the cutaneous surface, and it is in the course of these that the great majority of abscesses occur—probably because the vessels of serous structures are too small, unyielding and remote from the external world to admit the introduction of many impediments, while the mucous structures are so abundantly supplied with fluids as to more readily wash away disturbing accumulations. Be this as it may, observation shows that the majority of abscesses occur in the course of those arterial divisions which flow toward the skin. The process of destruction, therefore, cuts off the free flow of nourishment to the outer tissues in the same way that ligation of an artery will prevent the active nutrition of the parts directly dependent upon it. A collateral circulation may maintain the vitality in both cases, but the vigorous integrity of the part cannot be otherwise than crippled and it will, therefore, be the more inclined to decay. In the case of abscess, this obstruction of nutrition upon the cutaneous, serous or mucous aspect of the pus cavity, disables the plastic wall in this direction and prevents it from offering as vigorous a resistance to the influence of the pus as is offered in better nourished directions. As an immediate consequence, we find the purulent material committing ravages in this place more rapidly than in any other, breaking down the lymph wall on this side and enlarging the size of the artificial basin. Proceeding in this way, the surface is reached sooner or later, an opening is made and the contents of the abscess are discharged.

It has, heretofore, been the general opinion of surgeons, that abscesses burst externally because they find the least resistance in that direction. This fact, undoubtedly, has much influence—the lining membrane of mucous cavities and the cellular and cutaneous tissues covering muscular structures being softer and more easily broken down than parts of a fibrous structure. Hence it is but just to look for greater corrosions by the pus of an abscess in those directions. But this consideration alone is by no means sufficient to account for the apparent anomalies of progress occasionally observed. Thus, abscesses which are situated between the abdominal muscles and the peritoneal membrane, and much nearer to the serous cavity than to the cutaneous surface, are found plowing their way through the muscles to the skin and discharging their contents outwardly. Yet, in other instances, abscesses on the outer surface of the peritoneum will destroy for themselves a way into the peritoneal sac without, apparently injuring the abdominal muscles at all. Why is this, if not from the proposition that, in the first case, the arterial ramifications which inclined toward the skin were concerned, and, in the latter case, those which supplied the serous structure were involved. "And in the same way," says Miller, without recognizing the anatomical fact of which we have spoken, "abscess of the lung, or even of the pleura, is more likely to be discharged through the bronchial tubes than to make its way through the thoracic parietes." And he adds another sentence which embodies a very beautiful consideration: "How wise is the arrangement whereby important internal cavities are invested by such a tissue [and have such a distribution of blood vessels] as effectually resists the inroads of advancing matter, while mucous canals, terminating on the general surface, are calculated to receive and discharge the noxious formation."

As the pus in an abscess destroys a way for itself toward the surface where it inclines to discharge, the wall of plastic lymph, or fibrin, is observed to gradually become more yielding to the pressure of the finger, returning an elastic feeling. The space between the surface and the cavity perceptibly diminishes; a new and more elevated ridge of fibrinous deposit is formed in a circular or oval form near the skin and, as this increases in thickness and distinctness, the original plastic dyke in its center becomes softer and finally breaks down. This is termed the process of *pointing*, the point being usually in the central aspect of the cavity, though frequently, also, quite to one side and particularly at the lowest or most pendant portion of the abscess.

Percussion is usually employed to determine the existence of pus in a cavity. The finger, or one hand, having been laid upon one side of the inflamed area, a finger of the other hand is placed against the opposite side. A sudden pressure is then made by the latter finger, which at once causes a fluctuation of the fluid in the abscess and a swelling impression is conveyed to the hand on the opposite side. Much delicacy and considerable practice are required to detect fluid in this way in abscesses which are deeply seated; but experience soon renders a person skillful and enables him to be very correct in the conclusion as to whether pus is or is not present. It is sometimes very important to make such an examination and form a just opinion upon the question, such knowledge being indispensable in determining the time and place of incision.

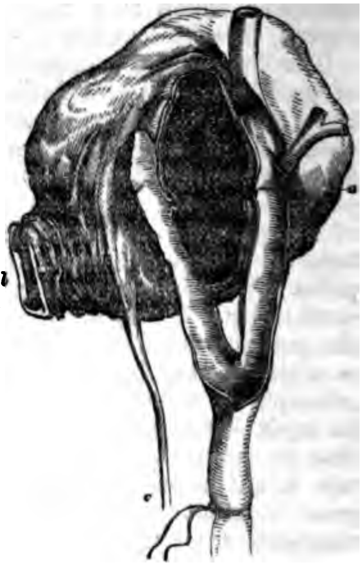
TREATMENT.—In the management of an abscess three indications are to be filled. 1st. Relieve the parts from the increasing congestion and put them in such a condition that they will be able to exude plenty of molecules and thereby render the pus of a bland character. This is important in order to cut off the advancement of the destructive process. The course adapted to this purpose will also loosen the surrounding structures and ease the pain of tension, which is so severe in the dense tissues. 2d. Seek the earliest opportunity to have the purulent material discharged. 3d. Promote the healing up of the cavity. This last indication embraces both local and constitutional treatment; the first guarding all sources of immediate excitement and placing the parts in a working condition—by which they are fitted to build up the new tissues readily; the second relieving the system of all injurious influences and establishing the free action of all functions which may have been wholly or partially interrupted, thereby securing a healthy, nourishing fluid.

The first of these indications is fully answered by the use of poultices and fomentations. The relaxants and demulcents are to be used, stimulants not being advisable in acute cases. Ulmus, linum, malva and other articles that will retain moisture and heat, should form the foundation of the poultices. They may even be made to constitute the whole of the poultice—such articles, when moistened, making the most soothing applications that can be used for ordinary purposes. When the tension of the tissues is great and the pain acute, lobelia should always be added to the demulcents. Let the poultices be of considerable size, well wetted and renewed as often as they become too warm or in anywise dry. The principle of their action has been fully discussed in the chapter upon *Inflammation* and need not be repeated here, further than to say, that they loosen the rigid structures and maintain a sufficient diameter of the capillaries—conditions of great moment to the quiet of the patient and the steady nourishment of the parts. The local application of vapor at a very low temperature is productive of much benefit. It may be repeated several times in a day, the poultices being worn in the intervals.

In persons of hardy constitutions and in those previously in the enjoyment of good health, no further treatment may be required till the abscess is ready to be opened. But such cases are unfrequent—a lodgment of uneliminated materials forming the origin of the great majority of purulent destructions in the deep tissues and, general impurity of the system being then necessarily existent. Active constitutional means will then be required from the outset, not so much with the design of immediately benefiting the abscess as of preparing the animal fabric to rebuild what will be lost by the corrosion. As these means more properly belong to the third indication, their further consideration will be reserved for coming paragraphs, allusion being made to them here that the practitioner may know at what time their use should be entered upon. It is proper also to mention that these constitutional means afford relief to the local suffering in all cases, though more markedly so when the abscess is of large size and the whole circulation is enlisted in the effort of resistance.

A few days, in some instances a few hours, will suffice to soften the outer structures and invite such a considerable effusion of pus cells into the cavity of the abscess, that the evacuation of the purulent material will be demanded. It has heretofore been the practice to leave the rupture of the surface and the discharge of the pus almost wholly to nature, surgical interference being usually postponed till the pointing was very prominent and the abscess about to burst of itself. That every purulent accumulation will seek and make an outlet, sooner or later, is well known; but this fact does not justify the dilatory surgery which has been too commonly advised and practiced. If the accumulation is situated under some deep and tense fascia, as of the thigh, the corrosive matter may burrow great excavations along the part for a considerable distance, destroy important muscles and commit alarming ravages, before it finds its way to the surface. In cases of sub-periosteal abscess, as in whitlow, the bones are likely to be destroyed before their covering will yield to decay. Sometimes, when the pus is sit-

Fig. 3.



Mr. Liston's case: *b*, the external opening of what was an abscess; *a*, the ulcerated communication between the cyst and the carotid artery—the latter has been sliced open; *c*, the par vagum.—*British and Foreign Review.*

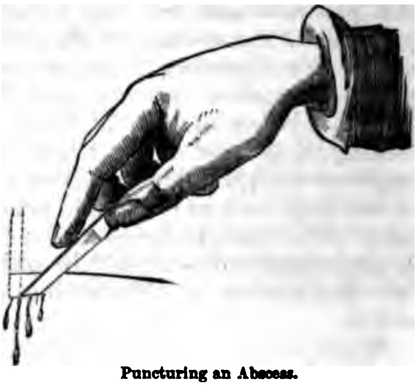
uated under dense parts, the fibrinous deposit will itself be broken through and the fluid let loose among the unprotected tissues and devastate and rot them without check or limit. If the abscess is in the neighborhood of arteries, these may be destroyed and life jeoparded by delay—the same may be said of other vital parts; and the pus is even absorbed, under some circumstances, becoming the source of great injury to the whole system. The sufferings of the patient are also protracted by these delays, much to the exhaustion of the general strength; and (if startling irruptions of pus and advancement of destruction do not occur) the cavity itself will be all the while enlarging, making the wider breach to be healed after the contents of the abscess have been finally discharged. In every way, therefore, do these cases call for the prompt assistance of art; and the surgeon who will tamper, hesitate and procrastinate, not only hazards his own reputation but jeopardizes the welfare of his patient. It should be his inviolable rule, therefore, to endeavor to detect the presence of pus at the earliest moment, and then open a way for its discharge. When the areolar tissue, or some quite unimportant locality, is the seat of the mischief, this course may not be so imperative—a simple protraction of pain being the only result of waiting; but, as the whole art of medicine, whether surgical or otherwise, is designed for the mitigation of pain, this single consideration should be sufficient to dictate an incision into the abscess as soon as the presence of pus is fairly detected.

When abscesses are formed in the vicinity of large blood vessels, the possibility of injuring the latter is often urged as a reason for delaying an incision. This argument is not a very solid one; for the ichorous character of long retained pus is quite certain to destroy the vessels and lead to the most serious hemorrhage, while a proper study of the position of the arteries and veins will enable the skillful surgeon to so puncture an abscess as to avoid all risks from such injuries. In such positions, too, the purulent cavity is almost invariably superficial to the large vessels, as upon the neck; and the vascular coats are of such firm structure as to easily resist the mild force which should always be employed in making such incisions. Nothing but the rude plunge of unjustifiable violence is likely to do the blood vessels any damage, and delay may prove fatal by ulceration of the artery, as may be seen in the instance illustrated by Fig. 3.

The instrument best suited for opening abscesses is the narrow-bladed bistoury. One with a straight edge and a thin back, or, better still, one with a double edge, is preferable to all others, as it will penetrate the most readily and is manageable at pleasure. The gently curved bistoury, with a single edge and a very fine point, is to be chosen for superficial abscesses when they are much elevated above the natural surface; but the straight-edged blade will answer sufficiently well. The broad and clumsy abscess lancets of surgical shops are quite improper instruments and should not be sanctioned by the surgeon.

In deep seated abscesses the point of the blade should be placed perpendicularly to the surface and the knife held rather loosely in the hand, with the fore-finger placed upon the blunted root of the blade. It may be steadied in this position by placing the index finger of the opposite hand against the blade and on the surface of the integument. A better way is to use the fingers of the free hand to level or draw the skin over the abscess, by placing them upon the outer edges of the inflamed surface and then gently separating them. The knife is to be introduced with a steady pressure, and not with a sudden plunge, which is almost certain to startle the patient into a jerk and may even carry the blade through the abscess, to the injury of some important part beyond. The knife should be carried forward till the absence of resistance denotes that the cavity has been reached; then it should be drawn backward with a gentle sweep, that the opening may be enlarged to a size sufficient to allow free evacuation of the pus. Patients may be placed upon a couch that they may not faint.

FIG. 4.



Puncturing an Abscess.

In superficial and prominent abscesses, the point of the bistoury is gently inserted into one side of the softened integument, carried steadily forward to any desirable spot and then passed out again. Let the whole blade be now lifted upward and at the same time carried forward or backward, so as to give it a saw-like motion: the integument between the two points will thus be successfully severed. The simple introduction of the point of the knife is enough for small abscesses. The curved and sharp-pointed bistoury is the best instrument for the transfixion of abscesses.

The lowest or most pendant portion of an abscess is always to be chosen as the spot for incision, that position giving the best opportunity for the escape of the purulent material. The extreme limit is not to be sought—but that spot which is distant from the center, yet not against the fibrinous wall, and which will be lowest when the patient is in the position which he will be most likely to maintain for the greatest length of time, should be selected. When the superficial integuments have begun to disintegrate and a soft center is discovered in the firm plastic wall, that point should always be chosen for the insertion of the knife, it being the one selected by nature herself. If an incision is made elsewhere than through this softened spot, the spot will still be likely to decay (having been already destroyed by the contact of the pus), and the existence of two openings will admit the free ingress of air to the cavity—a result which is almost invariably followed by disastrous consequences. The presence of atmosphere upon the inner surface of an abscess is as foreign to it as gastric juice is to the mouth, or bile to the lachrymal gland, and invariably causes destruction of the granular effusion (see Ulceration). The surgeon must always be wary, therefore, how he admits its ingress; especially must he guard against all unnecessary liability to this result. In quite superficial abscesses, the selection of the point of puncture is not of such immediate consequence.*

In abscesses of considerable size, whether chronic or acute, all the pus should not be allowed to be discharged at once: a portion of it should be permitted to escape and then the orifice closed with a pledget of cotton, or a strip of adhesive plaster, and not reopened for six, eight or twelve hours, according to the acuteness of the case. The sudden evacuation of large quantities of purulent material is followed by great depression of the strength, a recession of blood from the surface, shivering and, occasionally, death. The surface of the cavity, too, will afterward be liable to extensive ulceration. These consequences appear to be the effect of atmosphere suddenly admitted to such a wide surface. The danger is much greater in chronic than in acute cases; but the fact should be carefully remembered in both, and the rule it establishes consistently carried out, especially where the strength of the patient is already exhausted and a febrile resistance of a typhoid or hectic character has been set up. When there is no need of paying attention to this rule (which is the case in all small abscesses), the contents of the cavity may be evacuated by gentle pressure exerted upon its sides, care being taken to not injure the tissues by any violence. When all that will *readily* escape has passed out, a very thin slip of oiled silk lint, or fine linen, may be inserted into the orifice to keep its edges from uniting. This is made necessary, from the fact that the granules on the inner surface will not all be made into good tissue, but some of them will continue to decay till the whole cavity is healed up. If the debris of this decay is not allowed free exit, it will constitute a new abscess and require a new opening for its discharge. The introduction of some pliant solid into the aperture (although not necessary in every case), will be found to be a good safeguard against such a contingency. It can be removed every day, or oftener, and all the purulent formation allowed to pass each time.

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*We once saw a case of lumbar abscess supervening upon an erysipelas, in which the most extensive injury was done by a gross piece of surgical carelessness. The attendant, wishing to make as much display as possible, called in several neighboring [country] practitioners to witness the "operation." The patient, a lady, having been turned upon her side, the site of a very extensive lumbar abscess was seen, extending over a space nearly seven inches in length by two and a half or three inches in breadth. The whole surface was soft. At the lower extremity, just upon the left side of the termination of the sacrum, was a greenish spot about the size of a dime. An examination of this detected a very small opening, through which comparatively laudable pus was oozing. The case had been delayed so long that nature had taken the work away from the surgeon; but he was not to be thus disappointed, so he proceeded to make a very free incision opposite the third lumbar vertebra, where the integuments proved to be quite thick and sound. The pus flowed readily, and, when it ceased, the operator used his hands till nearly one quart was taken away. The lady, already quite feeble, fainted, but soon revived. It was evident that, as the pus escaped at the large orifice, air had rushed in at the small one, and the whole cavity of the abscess was occupied with atmosphere. The patient's health failed rapidly; the integuments around both the natural and artificial orifices began to slough away and continued till the whole interior of the cavity was exposed and the processes of the lumbar vertebræ laid bare. Ulceration continued for several weeks, the whole of the soft integuments became disintegrated and several portions of the vertebral bodies and processes came away. The lady died. That the case was a serious one from the first was very evident, but it was equally evident that the operation of the surgeon was wholly unjustifiable, and could not but have had a share in expediting the calamitous result.

After the hemorrhage and the flow of pus have ceased, a warm poultice of elm, bread and milk or flaxseed, may be placed upon the surface—being made large and thick, so as to cover the whole area and absorb all the discharge. These poultices should be renewed two or three times a day and continued till the vascular excitement begins to die away and the purulent discharge has nearly ceased. Poulticing may then be discontinued and the orifice of the sore dressed with some simple cerate, lard, sweet oil or other protective and appropriate lubricant. Some practitioners very improperly continue the use of poultices after the inflammation has decidedly begun to abate. This course so extensively relaxes both the arterial and vascular capillaries, that stagnation is favored and the part weakened, even if the serous exudation into the parenchyma of the parts is not actually helped to pass into decay.

The simply relaxing poultices are only applicable to those cases in which the vital force is capable of sustaining an active capillary exertion; and as these cases are altogether the most numerous, such appliances are the ones most commonly called for. But when the surface over the abscess is of a venous hue, evincing capillary feebleness and stagnation, assistance must be rendered by adding small proportions of stimulants to the poultices. Zinziber is usually all sufficient; asarum, polemonium reptans and aralia racemosa, will often be adequate to arouse a better action; but, in very degenerate cases, where the edges of the incision become enlarged and ragged and the surrounding areola livid and so soft as to retain indentations, capsicum, xanthoxylum and the other powerful stimulants, must be at once employed. The proportion of these agents will depend wholly upon the degree or quality of the degeneracy—a little sometimes answering, while again the poultices may be almost composed of them. Fortunately, these cases are very rare and are usually prevented and most promptly relieved by the early use and active continuance of the constitutional measures to be hereafter mentioned.

In still more rare instances there is a marked tendency to sloughing, the skin assuming a greenish tinge over the center of the congested locality. This may be observed before the pus reaches the surface; or an apparently healthy abscess may have been opened and its edges and surrounding integuments afterward assume a greenish-black hue and streaks of green black and brown material may be intermixed with the purulent discharge. All these are evidences of a strong tendency to putrefaction and need very prompt treatment. Astringents and stimulants must be added to the demulcents. Myrica is valuable; geranium or quercus may be mixed with zinziber or capsicum; xanthoxylum with rhus glabrum leaves is good; the cortex of rhus glabrum root is appropriate and gum myrrh and cayenne make a most powerfully stimulating and antiseptic application. Whichever of these articles is used, it should only be added to the demulcents—as elm, flaxseed and mallows—in moderate proportions and its application discontinued as soon as the unhealthy tinge disappears and a healthy scarlet is re-established. When the outer tissues are apparently sound, the greenish discharge evincing a putrefying surface within the cavity, fluids of a stimulating and astringing nature may be injected into the orifice and the inside of the abscess thereby freely washed out and kept clean. The more particular consideration of the treatment of these cases will be found under the head of Ulcers, where they properly belong.

The *constitutional treatment* depends upon the requirements of individual cases. If the bowels have been costive and the liver torpid,* relaxing enemas and the repeated exhibition of leptandra or juglans should be resorted to for their correction. The skin should be bathed freely and a vapor bath given, whenever the natural pliability of the surface is not readily regained; but a flabby, spongy state of the skin must be guarded against by thorough friction after the vapor and stimulating drinks during the bath. If the stomach is the offending organ, a relaxing emetic should be given and repeated as often as appears necessary and such tonics as hydrastis, poplar, gentian, prunus and liatris, employed daily. When pus is absorbed into the system, an irritative form of fever is established for its removal. This must be managed by nervine drinks, as sage and asarum, aided by daily ablutions and the frequent use of soothing enemas, among the best of which is lobelia in elm water. The most scrupulous quiet and freedom from all excitement of both body and mind must also be enjoined. If the strength fails, sustaining diet, in the shape of spoon victuals, must be freely allowed and ginger, jeffersonia, eupatorium aegeratoides or aristolochia, used in weak infusion. It not unfrequently happens that the febrile effort assumes the *hectic* form, occurring in very distinct paroxysms every afternoon or evening and leaving the system quiet in the interim. The before-mentioned nervine drinks are to be used during the febrile exacerbation; the excess of perspiration should be checked by dry friction practiced several times through the day and dry, hot linen towels wrapped about the body, next the skin. The efficient tonics are to be employed steadily, but in moderate quantities, during the febrile intermissions. Very careful management is necessary, for the practitioner can not hasten or "drive" a cure. The treatment must be what is termed "expectant," and the surgeon should be content to sustain the system by his nervines and tonics, leaving the vital force to regain its hold upon the tissues slowly. Large quantities of medicine at lengthened intervals are almost worse than useless; but weak infusions should be used and administered in quite small doses every half hour or hour. (See *Hectic Form of Fever*, p. 71–74.) Where constitutional resistance is not manifested, but a general torpidity of secretion is observed, the system being clogged with morbific and depressing materials, what is termed an *alterant* course of treatment should be pursued in addition to the bathings and occasional emetics. Sarsaparilla, styllingia, arctium lappa, alnus, rumex and similar secernant agents, may be compounded almost at pleasure, not forgetting to add some gentle tonic, as poplar or cherry, when the case seems to require it.

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* Long continued hepatic torpor generally gives that peculiar yellow tinge to the pus that is seen upon the skin and conjunctivæ in jaundice.

The foregoing modes of management having been pursued (according to the necessities of individual cases) till the occasion for inflammatory exertion no longer exists, the cavity begins to heal up. The molecules or granules, which before commingled with the product of decay, now incline to adhere to the surface of the plastic wall from which they were thrown out. Here they are molded into new tissue, weak and tender at first, but soon becoming firmer and denser and shortly assuming all the qualities of the parts which were destroyed. Some of the granules are incapable of being organized and are disengaged from the healing surface, thereby keeping up a slight purulent discharge which gradually diminishes and finally disappears. A scab or scale is often formed by this exudation and afterward cast off. At the same time the plastic walls, which were before distended, approach one another—considerably narrowing the diameter of the cavity. In this way the whole part is healed up, all the destroyed tissues (except the pigment membrane and the pores of the skin) being restored. The process is termed *granulation* and a sore in this condition is really what is termed a *healthy ulcer*, especially when the destruction of tissue has been considerable and a large, open sore is presented. It is an object with the surgeon to get such surfaces to granulate steadily from the bottom—a thing sometimes quite difficult to accomplish, especially in abscesses of the perineum, where the edges of the cavity heal over and leave a fistulous opening. (See Fistula.)

Tepid water dressing, or an application of some unguent, is all that is now needed to further the cure.

Chronic Abscess.—Chronic abscesses are known not only by the length of time occupied in their development, but by the almost total absence of inflammatory resistance. They generally occur in persons of feeble constitutions, where the whole series of vital functions are but imperfectly performed and the life power yields up its hold upon the tissues with scarcely a struggle. The decay begins imperceptibly and progresses with slow and stealthy steps, making extensive excavations without provoking any particular evidence in the form of redness, heat, pain or swelling. The layer of fibrin is thin, exuded slowly and formed into a very dense structure. Few globules are exuded upon its surface, but little effort being made to cast out the contents of the cavity. The pus is, for the most part, fluid; but is not of that ichorous quality which characterizes the same portion of the pus in acute abscesses. The cavity seems to extend itself by a very gradual destruction of the tissues—layer by layer wasting away so slowly, that months and sometimes years are occupied in the decay. The walls of the cavity do not yield before the pressure of pus, as in acute cases, but slowly break down before the advance of chemical corrosion—the waste being replaced by the effusion of a corresponding layer of fibrin upon the outer surface of the area.

Abscesses of this kind may be of but small size, perhaps not larger than a walnut, while, again, and not uncommonly, they attain to a capacity of two or three pints. The vital effort at resistance is so feeble that it does not exert a repelling influence and discharge the foul matter, which is often found burrowing extensively under the cutaneous surface without making a passage of escape. The thin character of the fluid renders it very liable to absorption and it is not unfrequently taken up into the general circulation—entire abscesses being sometimes removed in this way. But little mischief results from such a termination; for, though the blandness usually given to purulent fluids by the presence of cells is wanting in chronic cases, the pus is of such a peculiarly unirritating nature as to scarcely cause any material injury to the system. It is more like a serous exudation than the product of decomposition, and, when received into the blood vessels, is cast out by the secernent organs with as much apparent ease as if it was an established part of the venous blood. Occasionally, however, it is quite corrosive and proves injurious.

Treatment.—Two general methods are adopted in the management of chronic abscesses, according to the circumstances of individual cases—*large* cavities being evacuated, *small* ones removed by absorption when possible.

The discussion of a chronic abscess by absorption should be, by all means, undertaken when the size of the cavity is quite inconsiderable and stationary, or at least not increasing with much rapidity. If the situation is at a part where a cicatrix would be unsightly, it becomes an additional inducement for attempting a removal in this way. A solid diet and moderation in the use of fluids, are to be first enjoined upon the patient. The general health is then to be regulated by the use of such medical means as individual cases may require. A somewhat stimulating course is usually best—all the secretions being established by the use of those gently relaxing agents which apply to each, and then some of the arterial excitants added, for the purpose of maintaining a free capillary circulation through them. Thus, leptandra with capsicum for the liver; apocynum for the galls ducts; lobelia with ginger for injections to the bowels; hydrastis, or poplar and eupatorium with capsicum, for the stomach; eupatorium purpureum, juniper, &c., for the kidneys, and an occasional emetic to impress them all. Having thus put the internal secreting organs in working condition, the function of exhalation is next to be increased, this being the chief means by which the contents of the abscess will be carried off. Frequent spongings, tepid wet-sheet packs, daily vapor baths and free exercise in conditions favorable to perspiration, are to be employed for this purpose. Relaxing poultices over the part are to be carefully avoided; but those poultices and washes which stimulate the absorbents are to be used. Among the best of these are the laurus sassafras and aralia racemosa, either of which may be used in poultice with the nymphea odorata—the parts being also frequently washed with an infusion of the same. The preparations of iodine, which have been so much praised as stimulants to the absorbent system, are worse than useless.

Large abscesses, or small ones which are steadily advancing in size, are to have their contents evacuated. This can not always be safely done, however, by a simple puncture, as in acute cases—the sudden admission of air usually becoming the occasion of serious difficulty. The parts are in such a low state of action, that the plastic wall can not throw out sound granules to heal up the emptied sac, but at once begins to decay, and not unfrequently breaks down so completely as to allow purulent infiltration among the sound structures beyond. The tissues decay with rapidity; large quantities of foul pus are discharged; the enfeebled vessels break down and there may be considerable hemorrhage. The constitution makes a feeble struggle to repair the damage, and this exhausts the strength very greatly, even when that effort is successful. Such may be the consequences of incision, even in small chronic abscesses, and it behooves the surgeon to be very careful before undertaking a direct opening. When the patient is of very feeble constitution and has cachectic tendencies, the operation should not be risked. When there are no cachectic inclinations and the constitution is not too much broken down, the abscess may be opened by direct puncture—the precaution having been taken to put the system in good condition by the use of alterants, baths, tonics, aromatic drinks and an occasional emetic. In making the opening, care should be taken to exclude the air as much as possible; to close the opening by a piece of lint, adhesive plaster or layer of collodion, before all the contents of the cavity have escaped, and to enjoin perfect quiet and nourishing food for several days afterward. If a typhoid grade of fever manifests itself, the system should be sustained as directed in another place (see p. 67–71). If a tendency to sloughing is manifest, the cavity of the abscess should be freely opened, all the pus allowed to escape, the part poulticed and the constitution sustained as was directed in similar cases of acute abscess.

If no injurious consequences follow this operation—the skin remaining free from a green color, a gentle inflammatory action being established and no local congestion or constitutional prostration appearing—it should be repeated after the lapse of seven or ten days. By these repetitions, the whole contents of the cavity will ultimately be discharged, perhaps, without any untoward result; but the patient should be well watched and a liberal course of nervine treatment and sustaining diet pursued. This was Abernethy's mode of relieving such cases—a mode to be avoided when possible, but still preferable to the prospects of certain death occasionally witnessed in chronic abscesses.

But the best and altogether the preferable mode of evacuation, is that known as the *valvular incision.* In order to perform it successfully, the surgeon should provide himself with: 1st. A very fine trocar and canula, the canula having a stop-cock, near its upper extremity, large enough to admit the passage of the trocar. 2d. A pump-syringe with an ejecting tube, the receiving tube fitting closely upon the canula. In performing the operation, the stop-cock is opened and the trocar placed in the canula. The instrument is then inserted just underneath the skin at the distance of an inch and a half or two inches from the wall surrounding the cavity. It is now pressed along gently toward the abscess and when it has reached the plastic wall the handle is raised and the point pressed forward, when it at once passes the pyogenic membrane. The trocar is now carefully withdrawn and after it has passed the stop-cock (measurement upon the shaft of the trocar having previously been made) the faucet is turned. The ingress of air is thus prevented and the blade of the trocar may be wholly removed. The receiving tube of the syringe is now adjusted to the head of the canula, the stop-cock opened and the fluid in the abscess *very slowly* pumped out. The stop-cock is then again closed, the syringe removed and the canula carefully drawn out. When its inner extremity passes the plastic wall the surgeon's finger should be pressed down upon the skin and slowly follow after the canula, thus effectually closing up the passage. When the canula is entirely removed, the external orifice is to be snugly covered by a piece of lint moistened with collodion, or by some other suitable means.

The abscess having been thus emptied, the process of absorption is to be favored by the means above mentioned. In this way the whole cavity may be obliterated without any untoward symptoms. If the attempt at absorption is not successful, but purulent material again collects in the basin, it may be again drawn out in the same way—the point of puncture being the same or different from the previous one, as may be deemed best.

Where a trocar and canula of the kind described can not be commanded, the ordinary instruments may be used, those of a very fine size being selected. The incision is to be made at the side, as in the previous operation, and the trocar withdrawn carefully. The pus should be stopped while still escaping in a stream, the canula withdrawn and the opening of the incision closed as before. A few days' rest being then allowed, the trocar should be introduced again and more of the purulent material taken out. Gentle and steady pressure over the whole surface of the abscess should be made while the canula is in the cavity.

Should arterial excitement, pain and congestion, follow these operations, a free incision should be made into the cavity of the abscess, as before mentioned—it being better to have an open ulcer to treat than a hidden cavity filled with pus that now passes rapidly into the most corrosive putrescence. Not only is extensive sloughing probable under such circumstances, but absorption of the noxious material is almost a certainty, and its degeneracy is such that an introduction of it into the system can not but be fraught with the greatest danger.

There are cases in which emptying of the abscess and attempts to induce absorption will fail to obliterate the cavity. It is then advisable to excite a gentle degree of local inflammation, that a free granular exudation may be established and the basin filled up by the formation of this into new tissue. To accomplish this, place a poultice of some of the demulcents over the parts, having previously sprinkled the surface of the poultice with ginger, or even with a light layer of capsicum. The case will soon assume all the characteristics of a mild acute abscess and may be carefully punctured and treated in the same way.

Internal Abscesses.—When abscesses occur in the parenchyma of the deep organs, their detection and management are fraught with many difficulties. If they are acute, their formation may be apprehended when sudden shiverings and a feeling of feebleness and nausea occur in the course of a case of local fever. When chronic, they can only be guessed at by the unaccountable failing of the general strength—no adequate cause for the weakness being apparent. These abscesses usually discharge themselves (in the course of time) into some of the internal passages, particularly the alimentary canal. When they occur on the convex aspect of the liver, they may find their way externally—pointing between or below the ribs, where they may be carefully punctured with a trocar and canula. Sometimes purulent accumulations in this organ burrow their way into and through the lungs and are discharged in quantities through the bronchial passages. Abscesses of the lungs belong to treatises upon practical medicine. Abscesses of the serous cavities, or those which find a discharge into the serous cavities, will be considered in those parts of this work which treat of serous effusions.

As every, or nearly every, case of internal abscess has its origin in accumulations of morbific material arising within the body, the antecedent manifestations will be those of acute internal inflammation, demanding the same general management that was directed for such cases in the chapter upon *Inflammation.*

Infiltration of Pus.—In very feeble constitutions, in those which have been injured by repeated syphilitic infection or are degenerate in consequence of excessively foul retentions and chronic disease, the destruction of tissue at any part is liable to be accompanied with an infiltration of the pus among the adjacent structures. The system is so reduced in strength, that an active inflammation can not be established to resist the invasion of any injury; congestion speedily takes place and the impoverished or degenerate blood can not furnish materials with which to build up a layer of protective fibrin. The product of decay is then left at liberty to worm its way among the tissues—its own thinness greatly favoring its rapid spread among the adjacent parts. The areolar tissue rots before it and all the structures are undermined and destroyed, perhaps passing off in great sloughs as in gangrene. Few conditions are more discouraging to the surgeon; for the very groundwork of successful operations—a vigorous frame and ability to make plasma—is destroyed and he has but little upon which to rest a hope in severe accidents or capital operations. The constitution, too (although feeble before), soon gives most alarming evidences of deterioration and the lowest grade of irritative fever is the only resistance that the body can usually make.

Treatment.—The treatment of these cases must be of the most prompt and energetic character. The indications are: to aid the low inflammatory effort to the formation of a firm plastic layer; if this is unsuccessful, to seek the early discharge of the pus.

The livid hue, the quaggy feeling and the spreading of the venous color, mark the tendency to congestion from the first. Whenever they are noticed, a most searching lobelia emetic, with moderate stimulants and an abundance of drinks, should be administered immediately. This will so effectually cleanse out the system and relieve it of the morbific loads that weigh it down, as to almost act as a complete revulsive. We have seen cases of this kind (which threatened the destruction of the whole lower extremities) arrested almost within an hour by such an emetic—the livid hue giving way to a scarlet tinge and the quagginess disappearing in favor of a firmer wall of lymph. One emetic is not always enough; for the system is usually so completely clogged up with the uneliminated secretions, that one, or perhaps two, will be needed every day for some time. Local applications of a somewhat stimulating character are to be employed. Ginger and lobelia in elm are excellent for a poultice. Grated raw carrots have been found peculiarly useful and may be mixed largely with powdered inflata and applied over the whole surface. In one case which came under our notice, where the purple of stagnation was very marked and the extensive quagginess gave unmistakable warning of impending danger by slough, we applied a fomentation of elm and capsicum, mixed in almost equal quantities. It was kept on for an hour, during which time it had aroused a hearty inflammation, led to a good plastic effusion and narrowed the limit of destruction to a trifling space. Green lobelia herb alone is preferred by many practitioners and has been employed with success, particularly when emetics and the free use of ginger or asarum were employed as adjuvants. Drinks of the aromatic stimulants are of great service and should not be neglected. The bowels are to be kept well unloaded by enemas, quiet is to be maintained and all possible pressure removed from the affected parts.

When these efforts fail to arrest the infiltration and are ineffectual in arousing the parts to the formation of a fibrinous dyke, the purulent exudations are to be let out by incisions through the skin. The position and extent of these will depend entirely upon the nature and extent of individual cases, the rule being that they should be made sufficiently free to allow a ready escape of the material. The incisions need be but light, fairly reaching through the surface of the sub-cutaneous tissues. They bleed but little, but the serous effusion at once begins to flow from their surfaces. A light elm poultice may be applied for the purpose of absorbing this discharge and the parts should be washed and dressed several times a day. The edges of these incisions usually slough away; but if energetic constitutional treatment (as above directed) is at the same time maintained, the ulceration is not likely to extend any further.

The efficacy and, consequently, the propriety of incisions has been called into question by many. They should never be made till considerable serous effusion has taken place and it begins to be quite evident that the parts will putrefy without the limitation of a lymph wall. Delay is then unjustifiable and not a moment should be lost. But it is equally unjustifiable to make incisions before there are good evidences of approaching decomposition, and the *possibility* of disintegration should not prevent the surgeon from making every effort to secure limitation of the infiltration before using the knife.

Secondary Abscess.—Secondary abscesses are those which arise *after* a local inflammatory excitement has begun to recede or has actually subsided. They are generally, but not always, connected with an erysipelas, and appear suddenly when the part affected is in a state of improvement and the patient is considered to be out of danger. Shiverings occur suddenly, a febrile excitement is again manifested and a swelling is observed in or near the part formerly affected by the erysipelas. The accumulation of pus is usually great and increases rapidly; it is of the thin quality and burrows extensively under the skin, there not being sufficient vital action to build up a fibrinous limit. A number of these abscesses may arise at the same time, or a series of them may occur consecutively, one appearing after another has been opened. The strength sinks rapidly and it is only by the most thorough and prompt medication that the practitioner will be able to avert the prospects of death.

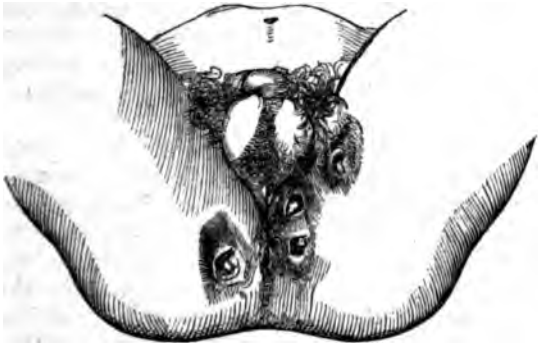
TREATMENT.—The pus must be discharged at the earliest moment, and the surgeon can not be too active in using his bistoury after the purulent accumulation is detected. No relaxing poultices are allowable, but the applications must consist in washes of capsicum, myrrh and capsicum, xanthoxylum and other powerful stimulants. The object is to sustain the parts and maintain a better circulation through them, that the progress of destruction may be checked by the vital action thus aroused. Constitutional measures, however, are the ones to be relied upon, local appliances being of but secondary importance. Drinks of zinziber, aristolochia, composition powder, pure capsicum and other stimulants, should be used freely. A thorough emetic, or even two or three of them, should be given each day till the tongue is cleared, the skin opened and sthenic arterial action established. The stimulating teas should always be used with the emetic. Fresh air is an indispensable requisite; quiet is important, and an occasional pill of lobelia may be given to soothe the nervous system and maintain a proper pliancy of the skin and capillaries. When the pulse becomes full and strong and the skin is of a good glow, the stimulating drinks need not be pushed so vigorously; but tonics, stimulating washes and a generous diet, should be maintained till the patient has fully recovered.

Sinus and Fistula.

A *sinus* is a large, open passage leading from the cavity of an abscess and remaining unhealed: a *fistula* is a contracted sinus, being simply a narrow tube with dense, callous walls, pouting orifice and slowly suppurating surface. These canals may be found in any part of the body upon patients who are in feeble health and have not sufficient vigor of constitution to close up an abscess with firm granules. The perineum, however, is the most frequent seat of them.

Feeble health alone does not prevent the closing up of the cavities of abscesses; but the presence of some shreds of half-decayed cartilage, the proximity of foul excretions or the retention of spiculæ of decayed or fractured bone, may prevent the completion of the healing process. Such passages may remain unclosed for a series of years—causing very unpleasant feelings and proving a source of great annoyance, as well from the muco-purulent discharge which continues to pass away, as from the pain and uncomfortableness to which they give rise. Sometimes there is but one tube; at other times there are several of them joining together to form a common one; again one single tube may open upon the surface by several

FIG. 5.



Fistulæ in perineo.

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pouting orifices, or each of several tubes may have its independent opening.

TREATMENT.—The treatment of sinuses and fistulæ is generally a perplexing undertaking, it being very difficult to properly remove the callosity of the walls and obtain a granulating surface. The walls of these canals are so firmly built up, that they seem to be almost cartilaginous and natural; and the character of surrounding circumstances is generally unfavorable to efficient vital action. The surgeon, therefore, should always be wary in promising speedy and easy cures; but he should, on the contrary, impress such patients with the facts, that no cure is likely to be effected without pain, and that months may be required in its completion.

The practitioner should first remove every solid that can possibly prove a maintaining cause of the suppurative opening. The probe will determine what these are (sometimes the finger may be used to aid in their detection), but the explorations should *always* be conducted with the greatest possible gentleness. If some offending substance remains in the cavity of the original abscess, or protrudes from the wall of the tube, its removal may first be attempted by a careful to and fro movement of a probe. If this should not be sufficient to effect the desired object, the scoop may be used gently; and, when spiculæ of bone or shreds of half decayed cartilage lie in the canal, the forceps, scalpel and scissors, may be required. The arterial excitement aroused by this gentle use of instruments may, now that the maintaining causes of the fistula have been removed, prove sufficient to produce granules upon the surface, when the tube will be readily healed up. This is most likely to take place in recent cases; but in cases of long standing, a persevering course of medication is generally required.

The next object to which attention must be directed, is the removal of the callous wall. This may be effected in several ways. That which Physio-Medical practitioners have usually found best, is the daily use of baths, lobelia and boneset pills and aromatic drinks. These means invite the blood to the surface, eliminate impurities from the system and give the absorbents free play. It is but very seldom that this mode of management will fail in removing the callus by absorption and bringing the fistulous parts to a pliant and more natural condition. A few weeks, even a few months, may be required to bring about this result; but the end is accomplished with so much pleasure to the patient and places him in such a state of vigorous health, that this practice deserves the preference over all others and should be thoroughly and perseveringly tried before other means are resorted to. Even should all the callosity not be removed by this mode of management, most of the fibrinous wall will certainly be absorbed and but little remain for removal by escharotics; and the system will also be thereby restored to that free and hearty condition which is of so much importance in healing up the canal—no matter by what means the callosity has been removed. An ancient mode of breaking down the fibrinous wall is by the use of the actual cautery—a red hot wire or piece of iron being passed lightly and very quickly over the whole fistulous surface. Strong solutions of potassa fusa have also been employed, and many surgeons favor the introduction of crude nitrate of silver. The object of using these caustics is to break down the pyogenic membrane and make an open sore. To effect this skillfully, the escharotics must be applied so quickly that they will cause the slightest possible eschar upon the lining surface of the canal. If the application is continued long enough or repeated often enough to cause deep desdestruction of the parts, the gap will be widened and decided mischief done. It is but seldom that the caustics will have to be employed when the above course of medical management is judiciously pursued; and when this course is not completely successful and escharotics are demanded, nitrate of silver will generally prove sufficiently powerful, and one application of it is usually all that is required.

Removal of the callosity by compression is sometimes practiced. This treatment consists in applying a pad over the entire track of the canal and then bandaging it on with sufficient tightness to provoke arterial excitement—care being taken to avoid that degree of pressure which will produce congestion. The plan requires much nicety in adjusting the compresses, and is not comparable, in points of safety and efficiency, to that for which preference has been already expressed.

Some practitioners use injections and poultices in addition to the above system of baths and relaxants. The poultices are generally of a stimulating nature, as, zinziber, aralia racemosa, or polygonum, mixed with the demulcents and such relaxants as baptisia, cerastus scandens, cimicifuga or sambucus. The injections are generally made of infusions of such articles as podophyllum, phytolacca or sanguinaria, till the callous wall breaks away and a granulating surface appears; then the canal is treated with simply cleansing injections and the stimulating quality of the poultices is modified to suit the degree of arterial excitement that has been aroused, or entirely omitted, as may be considered most advisable. We have never tried this practice, nor seen it tried by others; but the standing of the gentlemen who have given us assurances of its efficiency, warrants an introduction of these remarks, that the plan may be further investigated and reported upon.

After the lining membrane of the canal has been removed and the callous wall softened, a granulating surface usually presents itself. An active inflammatory excitement may accompany this when the patient is robust and the escharotics have been freely applied to the part. The vital effort may be feeble when the patient is in poor health, when there is a mercurial or syphilitic taint in the system or when no escharotics, and but mild local stimulants, have been used in the removal of the callosity. The part is now in a state of ulceration and is to be managed according to the degree of its granulating capacity, as has been already described in the treatment of abscesses and as will be hereafter more fully explained in the chapter upon Ulceration. Sinuses and fistulæ of peculiar forms and in certain localities, will require more and different surgical aid than has here been mentioned. These cases will be fully treated of in the latter parts of this volume; but the medical treatment here given will be found applicable to them all.

Pyæmia.

Allusion has been frequently made to the dangers arising from the introduction of pus to the circulation or the system at large. The disturbance occasioned by this infection is known as *pyæmia.* The purulent material may be derived from a deep-seated acute abscess that has not been opened in good season; from any ulcerating surface, particularly when the discharge has been injudiciously forced to remain unremoved; from suppuration of the veins, either upon their inner coats (as in phlebitis) or across their trunks. The whole of the pus (liquid and cells) may be taken into the circulation by open veins; or the thinner portions only may be taken up by the absorbents or the inflamed lymphatics. These infections are always unpleasant, but increase in seriousness in exact proportion to the degeneracy of the purulent fluid. If mercurial taints or syphilitic contaminations exist in connection with the introduction of pus, the case becomes peculiarly grave.

SYMPTOMS.—M. Sedillot, as quoted by Professor Miller, is credited with having given a most graphic description of the symptoms of pyæmia. Never having seen a case of this kind, except in hospitals, and then under circumstances where we could not watch its progress from first to last, we use the description of M. Sedillot, as taken from the British and Foreign Medico-Chirurgical Review, for October, 1849:

"A patient is attacked by suppuration, when suddenly (either without any premonitory symptom, or some days after a hemorrhage, a diarrhea, a diffuse inflammation, an erysipelas or a painful engorgement of a wound) a more or less violent shivering fit comes on. Frequently there is observed a general trembling, chattering of the teeth, a drawing in of the limbs toward the trunk and a morbid diminution of the temperature of the skin; speech is difficult, the words uttered being short and interrupted; the eyes are hollow and the features contracted; the countenance is of a leaden or yellowish color; the respiration frequent; the pulse small, soft and rapid and an instinctive sense of great peril is presented. The shivering ceases after a period varying from ten to forty-five minutes; the warmth of surface returns and a slight transpiration is established. Erratic shiverings, however return, and not unfrequently at the same hours as in the first instance; the wound dries up or the suppuration becomes grayish or fetid; the surfaces of wounds assume a withered, flabby aspect; the bones become denuded and ill-conditioned ulcers arise or extend. The patient seems as if exhausted by fatigue and plunged into a kind of *coma vigil*, with occasional delirium, or into a deep stupor; the inspirations are made laboriously and become more and more accelerated, so that thirty, forty and fifty per minute are counted; the breath exhales a purulent odor; subcrepitating *rales* are heard in the chest, the air also seeming not to attain the minuter bronchial ramifications; the skin becomes daily more earthy yellowish, generally as if jaundiced; articular pains, with swelling and intra-synovial effusion, manifest themselves successively in the various joints; one or both of the calves may become the seat of considerable swelling, attended with great suffering; and sometimes severe stitches in the sides of the chest force cries from the patient. The tongue becomes dry; the lips and teeth are covered with a fuliginous paste; the belly is tender, the pulse tremulous and rapid, subsultus agitates the limbs, the eye looks dull, the cornea has lost its polish, the bladder is no longer emptied, partial paralyses manifest themselves, the voice is lost and the patient dies from the fourth to the eighth day in a state of extreme emaciation and after a prolonged struggle. These are the most common traits of purulent infection, but it is seldom that we find them all present. * * * Any wounded person (having a suppurating wound) in whom irregular shiverings, difficulty and frequency of respiration, a leaden or icterous coloring of the integuments, great prostration of strength and sudden wasting, manifest themselves, is, in our eyes, the subject of pyæmia. We would deliver the same opinion if, in absence of the shiverings, the above-named symptoms were present, together with a drying of the wound or a changed character in its discharges."

TREATMENT.—The prognosis of pyæmic cases is always extremely doubtful, and he does best who so manages suppurations as to prevent purulent infiltration and absorption. Some patients get along very well—especially when the pus is of a mild character, as in most chronic abscesses. Death, however, is more commonly the sequence; and those who escape with life, seldom enjoy any comfortable health afterward.

To stop the introduction of more pus, to sustain and invigorate the system and to aid the ejection of the purulent material already absorbed, are the indications to be answered. 1st. Let out all accumulations of pus, cleanse ulcerating sores frequently and keep them open and dress them lightly. 2d. Provide pure air, sunlight, quiet, moderate warmth, good diet and fresh water. Enforce the most rigid hygiene and forbid the use of tobacco, coffee and all other pernicious and depressing articles. Use the tonics moderately, but regularly—employing hydrastis, gentian or aletris, when the system is prostrated, and eupatorium or prunus when there is sharp arterial excitement. If the patient becomes irritable, use enemas of elm and lobelia and seek to have them retained; give *weak* teas of mentha viridis, lavandula or asarum and use gentle friction over the whole surface (see p. 74). If hectic symptoms manifest themselves, follow the principles of treatment laid down on pages 73 and 74. If the pulse becomes large and bounding, or if it sinks into the flickering typhoid character and the tongue becomes brown, the treatment already laid down for these different grades of febrile action must be pursued. 3d. Emetics, vapor baths and the alterants, used unstintingly and accompanied by plenty of stimulating nervines (as zinziber, aristolochia and composition teas and the third preparation of lobelia), will be found the most efficient means for cleansing the system and casting out the purulent accumulations. As the time for medication is very limited, the treatment must be of the most energetic character. Whatever is done must be done quickly and the medicines must be administered with the most unsparing hand.

CHAPTER III.

ULCERATION.

Ulceration in General.

FEW surgical terms are used in a more loose and indefinite manner than ULCERATION; and it seems almost impossible to give to it any definition that would be expressive of what writers meant by it. The only sense in which the majority seem agreed to employ it, is, that it is destruction of the external and internal vascular structures—of the skin and mucous membranes with their subjacent integuments. But it is not wholly restricted to these localities; and any *open* suppurating surface is said to be in a state of ulceration, no matter what the part is nor by what means it came to be exposed to view. Some writers seem to restrict its use to the disintegration of the simpler and more homogeneous structures; but there can not be any distinctions made between the mode of decomposition of the soft parts and that of the more dense parts. Some intimate that it is that form of destruction in which all implicated structures, whether of loose or solid texture, are destroyed together; but this must necessarily be incorrect, for it is an absolute law that tissues decay with different degrees of rapidity and can not all be chemically resolved in the same space of time, the dense ones resisting destructive influences much longer than those that are more open. From whichever side, therefore, an attempt at an exact definition of ulceration is made, it meets with opposition, and it is unsafe and impracticable to give the process any set and distinctive description.

View the question in all its aspects and the student will soon find that ulceration cannot be any thing more than a form or degree of suppuration. Being a disintegration of the animal organism, it must be caused by the influence of chemical laws. It can not take place without the existence of some degree of congestion; some grade of vital resistance will be made to the advances of destruction; the decaying portions will incline to pass into a fluid state and the destroyed parts can be replaced only by the vital effusion of granules. In all these respects ulceration and suppuration are identical. And after an abrasion of surface has been made by ulceration, the discharge from the sore will be bland, ichorous or putrescent, according to the completeness of the chemical control over it; the granulation will be rapid, slow or wholly unperformed, according to the degree of control retained over the parts by the vital power; and the solution of continuity will be repaired or induced in exact ratio to the triumph or defeat of the life principle. In all these respects, again, the laws of suppuration and the facts in ulceration are in perfect harmony. Various circumstances (as of locality, health of the patient and nature of the inducing cause) will make differences in the form, size, appearance and symptoms, of ulceration in different cases; and they will also cause every imaginable shade of variety in the appearance of the opening (ulcer) that is formed by the destruction. But in these respects, again, ulceration is but the counterpart of suppuration, in which it has been already seen that circumstances modify and alter the appearances and course of *every* form of destruction.

Nothing so misleads the mind as to attempt to make nice distinctions where none (or but very slight ones) naturally exist. We will, therefore, attempt no definition or description of the ulcerative process, but refer the student to the first section of the last chapter, which he should carefully peruse. When he obtains a clear understanding of the principles there discussed, he will have learned all that can be said to really characterize ulcerative decay. As a practitioner, he will be more particularly called upon to manage the sores that are formed by the several degrees of chemical destruction. These sores (ulcers) are variously classified, according to the degree of their degeneracy and the amount of vital effort manifested in them. All such classifications are necessarily imperfect; and the different kinds of sores imperceptibly lose themselves in one another and their characteristics often become lost; still classification serves to place a series of landmarks along the path that must be trod by the practitioner and serves to keep the mind in an even way. The following table will be found to present a tolerably correct arrangement of the various forms of ulcer, and will also show the relationship between the several reputed forms of chemical destruction:

SUPPURATION.	ULCERATION.	GANGRENE.
Bland Pus.	Simple Sore.	
	Weak Sore.	
	Indolent Sore.	
	Scrofulous Sore.	
	Cachectic Sore.	
Thin Ichor.	Irritable Sore.	
	Inflamed Sore.	
Putrescent Pus.	Sloughing Sore.	Simple Slough.
	Phagedenic Sore.	Sloughing Phagedena.
		Mortification.
		Sphacelus.

PROVOKING CAUSES.—Any thing that will produce congestion will lead to ulceration as well as suppuration; and all impediments to free vital action will so weaken the integrity of the parts upon which they make their impression, that the chemical power will at once gain upon the preservative power and the tissues will soon begin to decay. In many of those cases which are more particularly considered as ulcerations (the skin and subjacent integuments being principally involved and decomposing and sloughing off), the accumulation of morbific material in the system stands as a prominent provoking cause. Indeed, it is scarcely possible to conceive of an abrasion of surface taking place silently and without any apparent external injury, without associating the destruction with accumulations of foul elements within the body; and even when distinct violence has been done to the tissues that decayed, the sore can not remain long unhealed unless constitutional impurities lie at the foundation of the mischief. This is an important fact; and the surgeon, who would be a successful practitioner, must never forget the prominent part played by these morbific materials in every form of ulcer that comes before him. Local provoking causes are also numerous, and may consist of pressure, cold, mechanical violence, chemical injury, lodgment of foreign solids or any of the several classes of influences that have already been mentioned as constituting provoking causes of inflammation. As the object of this section is to give only a few general ideas upon these topics (their discussion having been already fully drawn out in previous chapters), we will at once pass to a consideration of the several classes of sores.

Simple, or Healthy Sore.

The simple ulcer is but a healing process, or the building up of any abraded surface. It has already been seen in the rebuilding of the emptied cavity of an abscess. The sound tissues beyond the abrasion throw out molecules, some of which form into cells upon the open surface while others pass off slowly, constituting the blandest form of pus and the most natural and agreeable protection against the exciting influence of the atmosphere. Those cells which remain attached to the living surface are soon observed to form themselves into a rudimentary tissue, becoming vascularized and traversed by nerves. They are quite small in size, form themselves more or less into a cone with the apex outward and give a red and literally *granular* appearance to the surface of the sore. The blood that circulates in them is arterial, the nerves are alive to sensations and respond to even trifling impressions made upon the surface, yet not with that persistent sharpness of feeling which marks an irritated condition; and the granules break down and bleed very easily. The layer of rudimentary tissue thus formed is soon organized and consolidated into a firm structure and upon its surface a new bed of granules is formed. Proceeding in this way, the gap (if no accident interferes) is speedily filled up to a level with the original surface. A very thin film of membrane is then observed to form around the margin of the sore and this gradually advances till the whole surface is covered over, a firm cicatrix being formed.

TREATMENT.—This form of ulcer scarcely needs any management further than that of cleanliness and protection. The simple water dressing is the most appropriate that can be employed. The surface of the ulcer having been very gently washed with a piece of soft linen (never use a sponge) wetted in lukewarm water, a fine layer of lint is dipped in water of the same temperature and laid upon the sore. Let the lint be just large enough to cover the area of the ulcer—which is preferable to the plan of extending it beyond the edges of the abrasion. Having adjusted this, place over the whole a piece of soft cotton; wrap a soft, light bandage around the part and draw it simply to a tension that will keep the lint and cotton from slipping out of place. Then enjoin rest and quiet—regulations of moment in all forms of ulcer and in some forms quite indispensable. This water dressing may be renewed every six, twelve or twenty-four hours, according to the requirements of individual cases. The object is to remove all uncleanness or liability to corrosion. When the lint has absorbed all the purulent effusion it can, it should be at once removed, otherwise the effusion will degenerate and the healing surface be retarded in its progress, even if it is not increased in size. As some sores discharge more than others, no specified time of renewal will answer all cases.

In small ulcers it is an excellent plan to place a moistened layer of lint in the basin of the sore and then paint the outside of it with collodion, leaving a very small opening at the most pendant point. This furnishes a perfect protection against the influence of the air, and any excess of effusion will find a ready escape at the orifice. Finely pulverized tannin may be employed for the same purpose—a piece of management adopted from a hint furnished by nature, whom we often see forming a crust upon the surface of a healing sore, which crust usually remains till reparation is effected and peeling off only after a complete cicatrix has been formed. Care must always be taken, however, to not allow any purulent material to accumulate under such a crust, whether it has been formed by nature or by art. Pus thus forcibly confined deteriorates rapidly, is very corrosive and will soon deepen the ulcer into an artificial abscess (as it were) by a destruction of the tissues underneath. Whenever the surgeon detects any such purulent accumulations (which he may know by a quaggy feeling under the crust), he should at once remove his lint and collodion, or the crust formed by tannin, or the scab formed by nature. The surface should then be well cleansed and the water dressing applied till nature herself seems disposed to form a new crust or the sore gets entirely well.

In dressing any ulcer, care is to be taken to avoid all unnecessary rubbing of the granules. The wiping and "digging" of an ulcerous surface, so much in vogue with some surgeons under the idea of getting it perfectly dry before making the application, is fraught with many unpleasant consequences. The exuded pus cells are nature's own protectors and should never be rubbed off any further than they will readily yield upon the use of the most gentle washing, or even upon moderate irrigation. It matters not if the sore is moist; let it remain so rather than excite a nerve or break a granule by friction. Gently drying the healthy parts around the ulcer is all that is necessary or admissible.

While the part itself is being thus attended to, the general health must be guarded with a watchful eye: for even in the most simple ulcer, trifling irregularities of the constitution will exert a baneful influence upon the sore. When the abrasion has itself been a remote consequence of systemic unwholsomeness (as, when an ulcer follows an abscess which had its origin in lodgment of uneliminated materials), the healing of the surface is quite impossible till the whole organism is regulated. On the contrary, the sore will be found degenerating and passing into what is known as a *weak* ulcer, even as excessive irritation and friction of either the part or the system will lead to the *irritable* ulcer. It may seem of no consequence, to the junior practitioner, to treat such a simple topical difficulty by constitutional means or even to fear that the progress of cicatrization can be delayed by any possible disability of the body. The sooner he lays aside such confidence in the potency of local medication, the sooner will he find himself in the way of successfully treating the *simple*, or any other, form of ulcer.

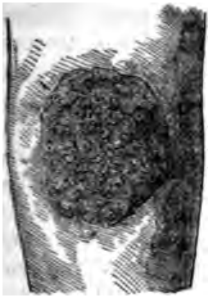
Frequent ablutions are to be directed; vapor baths are needed when the skin is prominently obstructed. Enemas should be given to unload the bowels when costive, the clysters being made of relaxants, demulcents and relaxants or demulcents and stimulants, according as the intestines readily yield or stubbornly resist. Leptandra or juglans is required for occlusion of the gall ducts and liver; emetics for foulness of the stomach and alterants (alnus, rumex, arctium, smilax, chimaphila, &c.), when a chronic inactivity of the secernents has left the circulation contaminated with morbific material. In short, the practitioner is to make an intelligent use of those means for the restoration of the body which are so abundantly furnished by nature, selecting and applying them according to the failures and degeneracies existing in different cases. They should be used with sufficient energy to restore a vigorous tone to the frame: then, and not till then, will there be a rational probability of an uninterrupted healing of the sore.

When the granules reach the level of the sound surface, it is no uncommon thing to find them becoming large, pale and of a bulbous form, with small streaks of scarlet (rudimentary capillaries) ramifying upon their walls. This increase in their size causes the whole ulcerous surface to bulge out and overtop the limits to which it should be confined in order to cicatrize. The granules break down and bleed easily; the sensitiveness is usually blunted, though sometimes acutely increased; and the purulent effusion becomes thinner and more scanty. This state is known as fungous, or "proud," flesh; it shows a deterioration of the lymphy effusion and requires to be promptly treated—for the abrasion can not be closed while such granules occupy its surface, and the longer they remain the more probable the degeneration of the whole sore. Fungous flesh may be treated in two ways: 1st. By the application of an escharotic, of which burnt alum, pulverized and lightly sprinkled over the surface, is generally preferable. We have dusted on powdered uva ursa, also sanguinaria, and with much success. Sanguinaria and rhus glabrum, in equal parts, are somewhat favorites with us. But whatever article may be chosen, let it be mildly escharotic and used only in small quantities. The object is to merely break down the outer layer of weak granules, astringe the tissues, and at the same time excite the parts underneath to a mild arterial exertion by which new and better molecules may be exuded. Nitrate of silver, carbonate of potassa and sulphate of copper, are decidedly inadmissible as caustics, even though they may have been diluted. The caustics should be used sparingly, applied at considerable intervals (from twelve to forty-eight or fifty-six hours) and discontinued as soon as the granulating surface has receded to a level with the skin. 2d. By compression, in which mode a light pledget of lint is placed over the granules and secured to its place by a few circles of a bandage. The lint should be so small as to not reach the thin pellicle forming around the edge of the ulcer and the bandage should be but gently tightened. Only a few hours of such mild pressure are required to break up the fungous growths; then the surface of the wound can be slightly irrigated with lukewarm water and the simple water dressing again applied. The treatment by compression is least painful; but it is difficult to say which mode is preferable.

Weak Sore.

The *weak* sore may be said to be a continuation of the fungous deterioration of the previous class—the pithy growths increasing to a much greater size and appearing in greater numbers than in the degenerate simple sore. The granules remain still above the sound, or cuticular, surface and become of a pale yellow, or very faint pink, color. They are very large in size and mostly spherical in form—not uncommonly ceasing to retain the limits of granules, but forming the ulcerous surface into a smooth, shining bulb, marked into numerous lobes by irregular fissures. The fungous tablet is but slightly vascular and quite insensible—only responding to harsh friction and not bleeding much when broken down. The purulent discharge is thin and contains few or no pus cells. The integument around the sore is of a dull venous or livid color, soft and slightly tumefied—evincing a crowding of the parts with deficient vascular action. The weak ulcer is next below the simple one and is usually an evidence of a feeble state of the system, though sometimes it arises from merely *local* inefficiency to repair the simple sore. It is an evidence of want of vital capacity and an inability to throw out that quality of coagulable lymph which can be made into firm integument. This may be owing to the exhaustion of the parts themselves, as when an extensive abrasion of surface has remained unhealed for a long time or the ulcer has been the result of a burn or frost-bite. Or long-continued illness previous to, or connected with, a simple sore, may have debili-

FIG. 6.



Weak Sore.

tated the frame; or foul atmosphere, as in poor hospitals, may cause a local and constitutional degeneracy which will at once manifest itself in the weak sore. But by whichsoever of these influences an ulcer of this grade may have been developed, it becomes a source of great annoyance to the practitioner on account of the obstinacy with which it resists his remedial efforts and its liability to extension. The puffed layer of fungus frequently liquefies and passes into ichor while still retaining its half-dead connection with the living parts. The purulent material, thus confined, is as likely to burrow into the soft plasma underneath as to find an escape outwardly. The stasis in the adjacent structures and the feebleness of their vital capacity favor the extension of the corroding material, which not unfrequently makes deep excavations beneath the sound exterior and breaks up large surfaces before the attendant is aware of the migration of the fluid. Many ulcers of a decidedly weak character may not burrow in this way; but it is more common to find these sudden and unexpected enlargings of the area than to see the extension take place by a gradual and steady breaking down of the sound circumference. The appearance and course of the sore, too, are very irregular—being now evidently granulating and healthy, again puffy, pale and fungous, next disintegrating and then, again, healing as in a plain and simple sore. These changes may occur within a week, and even within twelve hours of each other. A damp day, an east wind or a single surfeit, seems sufficient to check the vital action. A pleasant day, a sound night's rest, cheerful associations and even the unloading of constipated bowels, will, in turn, free the parts from their depressing load, when they will be seen again laboring for the restoration of the lost portions.

TREATMENT.—The water dressings, which were so efficient in the simple sore, are now no longer available, but active and decided medical measures are to be employed. The part needs prompt assistance—mere cleanliness and protection being now insufficient. The character of the remedial applications is to be of the stimulating kind—that kind which will increase the nervous susceptibility and sustain a free circulation, thereby preventing the tendency to an increase of decomposition through the weakening influence of stasis. The constitutional management must be of an invigorating and sustaining, as well as purifying, character. The granular surface may also require consolidation by astringents.

The treatment may be commenced by sprinkling upon the fungous protrusion a little very finely powdered ginger or aristolochia serpentaria, either of which will arouse vascular action and probably lead to the casting off of the flabby granules. Asarum, sassafras and polygonum, may be used for the same purpose. Where the sensibility is much blunted, arum triphyllum, hydrastis, xanthoxylum or even capsicum, is advisable—though such cases are rare; very lax granules may have the stimulating astringents applied, as myrica and rhus glabrum bark; or, the pure astringents may be mixed with any of the foregoing stimulants. The degree of weakness apparent in and around the parts must, of course, determine the quality of the stimulants to be selected; and it is best to begin with the milder means and advance toward the more powerful excitants as the surface is found incapable of response. The form of powder is advantageous, being in itself a mechanical as well as medicinal stimulant. The whole granular surface should be lightly covered; and the application may be renewed every six, twelve or twenty-four hours, according as the powder is or is not saturated with purulent discharge. A soft layer of lint or charpie may be placed over the powder. At the same time, a light poultice may be spread over the integuments around the sore, but not upon the granular surface itself. Such poultices may be composed of alnus, malva or any other demulcent for a foundation, and some of the better stimulants, as zinziber or aristolochia, mixed with it. If the surface is numb under pressure, use capsicum in very small quantities; if the sore is a long-standing one, hydrastis will be very available; if there is a deep livid color and an appearance of decay, employ myrica or gum myrrh, or add geranium to the ulmus and capsicum, or wash with number six and use ginger and elm in the poultices. Arouse a circulation at all times and prevent a spread of the destructive process by securing a free and active flow—in short, *excite inflammation*, for that is the proper way of getting rid of the fungous granules and the only way of obtaining an effusion of sound molecules. Graduate the stimulating quality of the poultices by the rule that was mentioned in the foregoing paragraph for the powder. Zinziber is usually sufficient, but there are times when almost pure capsicum will be none too stimulating. Where the discharge is very considerable, the poultices should be mixed rather dry, when they will absorb any thing that may flow over the edges of the granular surface. Dry ulcers of the weak class may be surrounded by moister poultices. Some practitioners spread their poultices quite over the whole sore, in this last variety of cases. The plan is good in some circumstances, provided the granular part is but lightly covered. The other mode, however, is usually preferable.

Another way of applying stimulants is that by washes and ointments. An infusion, or dilute acetic tincture, of capsicum is used for washing the whole sore and surrounding integuments, and then a mild ointment of the same smeared over the whole, including both the granules and the adjacent skin. It is then covered with a light layer of lint. When the discharge is trifling, this may be a good plan, though the milder stimulants for the granules are mostly preferable. In sores which discharge much, ointments are not at all proper for the fungous protrusions, but may be employed on the surrounding parts—the powder being used upon the granules as before mentioned. But ointments might better be discarded in all ulcers, poultices and washes being depended upon to the last.

In those rare cases where the proud flesh is very exuberant, it may be well to begin the treatment by sprinkling upon it powdered alum, or smearing it with a solution of lunar caustic; but the escharotics are to be avoided as much as possible and the propriety of their use in these cases may be very safely called in question. The sanguinaria or podophyllum, in powder, are usually all the caustics that will be required, and not more than one or two applications of these are often needed. They will break down the feeblest of the granules and leave a chance for better ones to be thrown out.

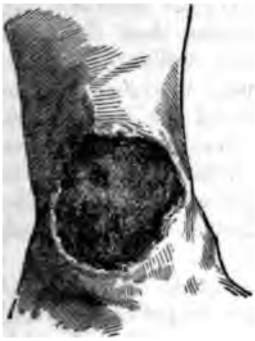
Gentle bandaging, when such a sore occurs upon an extremity, is advisable—becoming a means of sustaining the return circulation and preventing excessive congestions or considerable varices which are so likely to attend low ulcers and prove an unpleasant annoyance. Let the pressure be light, very light, and uniform. By light we do not mean loose, but just that degree of pressure which will bring the integuments to a state of plumpness without endangering the stoppage of the venous circulation.

The constitutional treatment should be very energetic and of that character which will arouse every organ to the performance of its function. The diffusible stimulants are to be added to all the drinks—asarum, hedeoma, zinziber, &c., being used freely. Vapor baths should be used, with stimulating and thorough friction. The tonics, as hydrastis, populus and aletris, may be required continually; a generous, but digestible, diet should be ordered; and fresh air, pure water and every other hygienic indispensable, should be provided in abundance. Rest is highly important, but a little daily outdoor exercise is most valuable when it can be taken; and pleasant companionship is a great invigorator of both mind and body. Months may be required to purify the system and heal up these sores.

Indolent Sore.

This variety of ulcer is the most troublesome and, perhaps, the most common that comes under the care of the surgeon. It is a still further degeneracy of the weak ulcer and is most decidedly "indolent," as its name implies—being deficient in both sensation and action and most positively wanting in power. There is, at best, but a slight attempt at granulation; and, not uncommonly, no healing effort whatever is made. The sore is excavated and the edges rise abruptly, forming a blunt, callous rim which is characteristic of this class of ulcers. The bottom of the cup-like surface within this rim is mostly of a pale, ashy color, generally smooth and glassy. When granulations exist, they are of a feeble character and sparsely scattered. The discharge is, for the most part, thin and watery; sometimes a little sanious, at other times curdy; again, a little flaky, from the breaking down of the weak cell walls; but the liquid portion of the pus is always greatly predominant. The semi-cartilaginous rim is nearly destitute of sensation, so is the glassy excavation, and the patient rarely suffers much pain from a sore in this condition.

FIG. 7.



Indolent Sore.

An indolent ulcer may remain unchanged for months and years—neither enlarging its area, interfering with the patients' avocations nor causing any material suffering. But suddenly some trifling accident, as a light blow, a scratch, a little over-exertion, exposure to inclement weather, &c., may lead to a most rapid spread of the sore—considerable portions of the adjacent integuments rotting and sloughing away. Under such circumstances, the circumference of the sore may be doubled in twenty-four hours and the few granules which had formed (and which were, perhaps, the work of months) may be swept away in half a day. Or, if sloughing does not occur, the tissue will soften and decay by ulceration (suppuration). The discharge remains thin, but becomes distinctly sanious; an inflammatory action is established around the parts, but is of a too feeble grade to accomplish any beneficial result; on the contrary, the determination of blood may be a source of further mischief by causing (through feebleness of the vessels) an extension of stagnation with a consequent inclination to further decomposition. At the same time the sensibility may be greatly increased and the sore become decidedly painful.

Indolent ulcers rarely exist from the commencement of an abrasion, but follow in the wake of weak, or even simple, ulcers which remain long unhealed. They are almost invariably situated upon the lower extremities and most generally occur in those who have reached or passed the meridian of life. The lower classes of people, or those who live in unwholesome localities and in an intemperate manner, are most liable to them. It is rarely, therefore, that they are found unaccompanied with long standing constitutional feebleness; and few ulcers of any class will pass into an indolent form unless on those who have been forced (or inclined) to breathe unwholesome air, drink unwholesome water, live upon improper food and in a state of uncleanliness, or in some other way disregard the laws of rational hygiene. The continuance of the same influences contribute to make such sores difficult of management.

TREATMENT.—In speaking of the treatment of indolent ulcers, we will reverse the ordinary mode of procedure and *begin* with the constitution. In no class of surgical cases is general and vigorous medication so necessary, aye, indispensable; and in none is the value of a physiological attention to the whole man so apparent. The triumphs of Physio-Medical practitioners in this class of sore have been most astonishing; and their success has been so palpably due to their superior mode of constitutional treatment, that he who would now neglect this point should almost be held amenable for neglect of duty.

One word will embrace the end to be sought by the medication of the whole system, namely, invigoration. The whole living fabric needs to be purified, cleansed and aroused—to be put into a condition fit for the uses of life. When possible, the patient should be removed from any low, damp and miasmatic influences by which he may chance to be surrounded—a dry and airy place being selected. Where humble means render such a change impracticable (as is too frequently the case), care must be taken to render the habitation occupied as wholesome as possible by good scouring, ventilation and the free use of lime. Once purified, it should be kept so. Rest should then be enjoined upon the patient, as far as convenient, and every opportunity should be seized to favor the afflicted limb with quiet. The diet should be of a wholesome kind, such as is highly nutritious and at the same time easy of digestion; and every hygienical regulation should be enforced as far as circumstances render it possible.

We question whether there are any cases of indolent ulcer in which the whole system is not in a gross state and overloaded with morbific materials which have either accumulated in consequence of unperformed secretions, or have been absorbed from the impurities of the surrounding atmosphere. Such foulness weighs down the whole mechanism and renders the healing of any considerable sore a palpable impossibility, and rather favors the development of trifling abrasions into unsightly ulcers than the contraction of considerable openings into small disorders. The ejection of such materials must be sought speedily and by every means that the practitioner can bring to bear; and the body is likely to have been in this degenerate condition for so long a time before the surgeon is consulted for what is counted as only a local difficulty, that the energetic and continued use of those means will be required to dislodge the poisons which have taken such a settled hold upon the frame.

No single thing that can be done will prove of as much service as repeated emetics; for they not only dislodge all uncleannesses from the stomach, but open up the biliary organs more effectually than any other means will do it, at the same time making the alimentary canal a channel into which the foul materials lodged in the more remote tissues will escape. The teas used with the emetic should be of a mildly stimulating character, as zinziber, asarum and hedeoma, to which considerable proportions of capsicum may be added in cold states of the system. The emetic itself should always be pure lobelia, the herb being the preferable part. These may be repeated every second or third day—in bad cases every day for a time; and they should always be managed so as to be thorough and searching. We have seen indolent ulcers, which had been *in statu quo* for many months, begin to improve within an hour after the use of one efficient emetic; and, though a dallying, half-tickling course of treatment may seem preferable, no mode calculated to effect a *cure* can at all compare with the free and frequent unloading of the system by this process.

At the same time, the surface should be thoroughly opened for the escape of material of a foul character. The vapor bath, used daily or after each emetic, is incomparable for this purpose. It should be of quite an elevated temperature, continued as long as is comfortable to the patient and aided by the use of such drinks as zinziber, asarum or other agreeable aromatics. If the vapor is used every second or third day, a thorough ablution with tepid water should take its place upon the intermediate days. The daily use of the tepid wet sheet pack is valuable, though much more likely to break the skin and carry out the foul materials in the form of boils. The secretions of the liver and kidneys are to be constantly looked after—neither one being excited to excess, but each maintained in proper freedom. For the kidneys, eupatorium purpureum, apocynum cannabinum, arctium or asclepias syriaca, may be used, employing them in that form which may be deemed best. The emetics are likely to open the liver and daily enemas to unload the bowels; but if these do not secure a free flow of bile, leptandra, juglans or apocynum androsemifolium, may be resorted to—not giving any of them in combination with those articles which are calculated for the kidneys. Attention is at the same time to be paid to the toning up of the system by the use of any of the ordinary tonics which combine a fair proportion of stimulating properties, as hydrastis, sabbatia, gentian, chamomile and populus. Some of the spices, as mace and cloves, may be added to these, to make them more pleasant. If a high grade of arterial action is established throughout the system, less stimulating agents will be required and the management should then be of that more relaxing quality directed for the inflammatory grade of fever. In addition to this, the pure and stimulating alterants must be employed largely and constantly.

Having begun this energetic course of management with the constitution, the sore itself next calls for attention. The character of the appliances must also be of the sustaining and arousing kind—the blood vessels requiring to be stimulated to a good action, that they may be the better able to cast off all portions of tissue that are too feeble for preservation and then heal up the whole by solid granules, as in the simple sore. The first thing to attend to, is to place the limb in an elevated position and maintain it there, when the patient is not engaged in exercise, that the return circulation may be favored. 1st. Sprinkle the whole surface of the sore pretty thickly with finely powdered capsicum, or saturate several layers of lint with a strong infusion of the same and lay them upon the bottom of the sore. Then cover the whole with a moist poultice, as of ulmus intermixed with zinziber. 2d. Make a strong wash of capsicum, xanthoxylum or polygonum, and bathe the parts, afterward covering them with a poultice of raw carrots very finely grated and sprinkled with asarum or aristolochia. 3d. Use capsicum with hydrastis, xanthoxylum with zinziber, gum myrrh with baptisia or myrica with aristolochia, either as a powder or in poultice. Ulmus with aralia, verbascum with flaxseed or daisy (chrysanthemum) with arum triphyllum, may also be used in poultice. Any of these modes may be employed at the outset of treatment in the purely indolent ulcer. They will be found highly efficient in arousing arterial action and a few hours will usually prove sufficient to obtain a decided arterial excitement in the part. The object of such a course is to get the benefit of this vital action (see chapter on *Inflammation*). The sensation having been aroused, the life principle will take cognizance of the injurious nature of the half-dead structure which fills up the body of the sore; blood will be at once determined to the part and an effort will be made to cast off the degenerate tissues. This is the first object sought by the stimulating appliances; for, though a slough is nearly always formed and the area of the sore much enlarged by this mode of management, the immediate hinderance to the healing process is thereby removed. No mode of treatment could possibly restore the parts to soundness as long as that low structure remained in its position; hence we seek to get rid of it as speedily as possible, that nature may be relieved of the weight of such a mass of corruption. Sometimes the degenerate portion is of large size and will require the most positive of the above modes to secure its rejection; at other times it is but slight and the mildest of those means will secure the desired end. The practitioner must be his own judge as to the requirements of individual cases—grading the degree of stimulus to the several necessities (see *Congestion*), but always acting promptly and fearlessly in favor of the creation of arterial action.

When the dead parts have been thus cast off, a healthy granulating surface is usually found below, particularly if the constitutional treatment has been energetically pursued for several days previous to the stimulating appliances. This state of things is highly favorable, being the second end secured by thus arousing this local action. The sore is now in the form of a healthy one, though still of rather a low vitality; but the life power has been aided in the first step toward the re-formation of granules, and a proper continuance of that assistance is likely to effect a cure. Dressings by poultice are preferable to all others: 1st, because they can be readily medicated; 2d, because they are light; 3d, because they serve to exclude the atmosphere, an important consideration when we recollect that these sores are likely to be a considerable time in healing up and would be almost certain to degenerate if not properly protected from the air. Before speaking of the agents that may be used, we would mention that no poultice should be employed, for this or any other sore, unless it is perfectly fine and compounded with the very best demulcents for a base.

In simple cases, the sambucus or celastrus scandens is sufficient. If a tendency to puffy granules is observed, the baptisia, aralia racemosa or hammamelis may be used. The heads of the ox-eye daisy (chrysanthemum leucanthemum) are very serviceable for the same purpose. The plantago major, both root and herb, is also useful. But these articles are mainly valuable when the character of the sore changes very decidedly to that of the healthy or firmly-granulating class. When a measure of indolence still remains, the sensibility being blunted and the granules tardy in their formation, agents of a more permanently stimulating quality will be required. As has been already mentioned, zinziber, asarum, polemonium and similar aromatics, may be used, with ulmus, linum or malva, for a demulcent foundation. Cornus, prunus and ptelia, may be employed to great advantage. In most instances, a fair proportion of powdered lobelia seeds may be incorporated with the other agents and the most marked benefit will be derived from their use. Our own favorite application is elm and ginger as a basis, with lobelia and nymphea odorata as adjuncts—the quantity of ginger being increased or diminished according as more or less stimulation is called for.

We are not in favor of unguents; but, as many practitioners think highly of them, and as they undoubtedly have an adaptability to all ulcers, we will present a few rules concerning their composition. Beeswax and mutton tallow form the best kind of unguents and appear to possess (separately) a sustaining influence peculiarly fitted to these cases. Beeswax and venice turpentine, heated together and mixed, form a most admirable unguent, which requires to be smeared on gently while at a softening temperature, or may be thinly spread on fine linen and then closely adjusted to the face of the whole sore. Mutton tallow with venice turpentine is equally beneficial, and a very small proportion of frankincense added to them, and the whole thinned with olive oil, forms a fine preparation for many cases. Bayberry tallow, softened by mixture with olive oil, is a favorite with us; and the addition of petroleum (or seneca oil), in small quantities, makes a remarkably efficacious agent. Copaiba with mutton suet is also of great value; or lard and beeswax may be compounded in quantities sufficient to relieve the stiffness of the latter, and then an ointment made by simmering in them leontice thalictroides, cimicifuga or senecio gracilis. A higher degree of stimulation may be secured by adding small quantities of hydrastis or arum to any of these; and any fungous granules may be destroyed (without injury to the firmer granulations underneath) by the combination of minute proportions of phytolacca, podophyllum or sanguinaria. Of these numerous means the practitioner must make that selection which seems, in his judgment, best adapted to the nature of the case in hand, always allowing his judgment to be guided by the simple rules of Physio-Medical science.

Whatever kind or form of application may be chosen, it does not need to be changed too frequently—six hours being generally sufficient, though cases are not unfrequent where every three hours will call for a cleansing of the sore and a renewal of the appliance. The amount of discharge will determine the frequency of change. Of course, the young practitioner is to understand that no one kind or quality of dressing is likely to be appropriate from the first to the last of the treatment, but that the applications will need to be varied when the character of the sore varies. When he has made himself familiar with the several classes of sores, he will have no difficulty in determining when a change is needed from a strongly to a mildly stimulating dressing, or from a largely stimulating to a more relaxing one, or from a relaxing one to one that is stimulantly astringing. When the surface of the ulcer remains of the granulating character (after securing the slough), let the appliance chosen be continued without variation as long as the sore does well. It is improper to make constant alterations with a progressing ulcer; and, though months may be required in some cases, the surgeon should be satisfied as long as he sees advancement. It is time enough to change when the aspect of the sore itself changes from the granulating character.

The great tendency to venous stagnation and formation of varices (which is observed in many, perhaps the majority of, cases) calls for the use of prompt means for their prevention. The horizontal position of the limb is usually sufficient for this purpose, but gentle bandaging may become necessary. When this is practiced, the compression should commence quite at the end of the extremity and be evenly applied along the limb, extending it one or two hand-breadths above the seat of the ulcer. The degree of compression should be moderate—under no circumstances being applied so as to cause continued uneasiness—and none but the mildest available pressure is admissible in cases of peculiar feebleness, as extensive mortification may be induced by too close wrappings. The bandage should be removed once in every twenty-four hours and good friction with the hand applied before its renewal. If any points of congestion are observed at the heel, the calf of the leg or any other part along the limb, compression should be at once discontinued, the horizontal position maintained and the whole extremity bathed with some stimulating lotion. The fracture-box makes a very desirable support when these ulcers are upon the lower extremities, and starched splints may be used when the upper extremities are concerned. When they are upon the trunk or cranium, compression is impracticable.

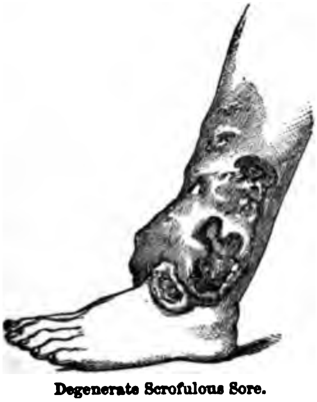
It has been a favorite mode, with modern surgeons, to secure a slough by compressing the ulcer with interlacing strips of adhesive plaster and then bandaging the limb pretty tightly from the extremity upward. From eighteen to twenty-four hours of such pressure usually causes sufficient stagnation in the parts to secure their death, when they will slough off and leave a granulating ulcer, as in the above mode of management. But the plan is far from being a philosophical one and is not always under the control of the applier, often causing a much larger slough than is necessary and not unfrequently extending the ulcer to adjacent parts of the surface despite the most skillful application of the bandage. We have never yet seen an occasion where this procedure was necessary, the above mentioned methods of medication having always proven sufficient and often succeeding after the plan of compression had been tried in vain. We are disposed, therefore, to lay this course aside altogether and rely upon that which has proven to be the *best* treatment, but will not deny that the mode of compression may not do good when the means embraced in the better mode are wanting.

HEALING OLD ULCERS.—The question of healing up old ulcers has long been a source of vexatious discussion to the chirurgical profession, many contending for its propriety and others denying its prudence with most zealous vehemence. It can not be doubted that the cicatrization of old sores has many times led to unpleasant, if not serious, consequences. These ulcers, having such a marked connection with constitutional grossness, become like drains or channels of escape for the impurities of the system. If, before getting them into a granulating condition, the surgeon should sprinkle on tannin or chalk, make a layer of collodion or do any thing else which is calculated to form an impervious crust upon the ulcerous surface, he shuts up the gateway against the escape of those morbific materials and the results can not be other than unfavorable. No longer finding an exit at the accustomed place, they may accumulate upon the bowels, in the kidneys, in the lungs and even in the heart itself, thereby leading to sudden death. It is to be noted, however, that such is not a *healing*, but only a *drying*, process—a direct interference with the expulsory effort of nature at a time when, and a place where, the vital force has but a limited hold. It need not excite surprise when disastrous consequences follow such a course; and the plan of hurrying the formation of a crust before the system itself is in a condition to close the sore by healthy granulation, can not be too soon discarded. But when the whole fabric has been purified, renovated and put into good working order, *every* organ performing its function and the blood being of a nourishing quality, the closing up of an old ulcer is not to be feared. Simple astringents are not to be used—but those sustaining and softening poultices and ointments which have already been mentioned are to be employed. Then, if nature is ready, she will heal up the *oldest* sore; if she is not, and you can not help her to get ready, let not her course be interfered with.

Scrofulous Sore.

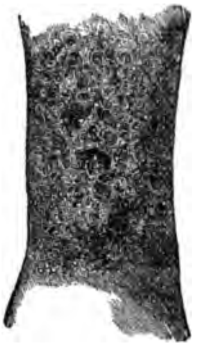
Persons of a scrofulous diathesis are liable to a most troublesome form of ulcer, which usually breaks out spontaneously in the neighborhood of the articulations, beginning in the sub-cutaneous areolar tissue. There is at first a deposit of degenerate albuminous material, which swells out the parts and gives them a hardened and irregular feeling. The skin soon appears palish blue, and is thin almost to the degree of muddy transparency. The deposit acting as an impediment to the free current of the blood, a low degree of arterial action is established. Thin and unhealthy material is exuded, which swells out the parts still more and gives them a boggy feeling. The sub-cutaneous tissues decay very slowly; the product of decomposition is thin and not very ichorous; the accumulated material

FIG. 8.



Degenerate Scrofulous Sore.

Fig. 9.



Undermined Scrofulous sore.

does not point at the surface, but may be seen through the thinned cuticle spreading over considerable space. Shortly the skin will break, allow the escape of the liquid pus and present a very weak and non-granulating surface underneath. These sores rarely occur singly, but are usually in clusters, from two to twenty being found thus associated in a group, and there may or may not be a sub-cutaneous connection between them. These may ultimately run together, or remain for a long time single. The surface between and around them is of a pale, leaden blue, and the parts are comparatively painless. The edges of the sores are thin and ragged, and the discharge is thin, presenting, at times, a somewhat curdy appearance from the presence of half-destroyed tubercular matter.

These sores evince the most degenerate state of the whole system—not a degeneracy resulting from accumulation of non-eliminated materials, but that which accompanies the low form of scrofulous cachexy. The strumous diathesis gives rise to the ulcers and then keeps them open, the local and the constitutional viciousness helping each other downward to the lowest degree of vital inefficiency.

The surface of the sores usually remains ungranulated for some time, and they exhibit a strong inclination to spread by gradual but persistent undermining and decay of the adjacent integuments, which are usually, though not always, cast off in small sloughs. The corrosion is seldom deep, occupies the skin and adjacent membranes rather than the more remote structures and burrows underneath the cuticle in various directions—giving an inverted edge to the sores, with blue, thin skin "floating loosely on the subjacent parts." Finally granulation is commenced, but the granules are feeble, pale, most decidedly fungous and almost destitute of feeling and vitality. The reparative process is of the most feeble quality, the vital force having neither strength in the part nor materials in the blood by which to make a good tissue. The sores may, however, be filled up and healed over; but the cicatrices are thin, blue and elevated, instead of being white, thick and depressed, as is the case in healthy scars; and there is every evidence of tubercular foulness underneath. Such cicatrices are quite certain, at some future day, to break out afresh into other scrofulous sores of a still more degenerate character.

TREATMENT.—The scrofulous sore is one most decidedly weak in its character; but, from the peculiarity of its origin and the general poisoned condition of the whole system, it is incomparably more difficult to manage than are other varieties of ulcer. The surgeon must, from the outset, place before his mind the fact, that he has no ordinary affection to deal with, and commence with the use of his most potent means, applying them without stint and with an energetic hand. As in the indolent ulcer, this treatment should be mainly directed to the constitution, rooting out from the system the foundation of the sore and regulating the condition of the entire system; for this is the chief hope upon which the probabilities of an ultimate cure rest. Though the ulcer is itself serious, it is but an expression of the degeneracies into which the body has fallen, and the direction of all the attention to it alone can not be productive of any lasting benefit.

The constitutional treatment required will be more fully considered in the chapter upon Scrofula, but the outlines of the management may here be marked. Alterants of a somewhat stimulating character, as stillingia, smilax, rumex and guaiacum, may be used; or the milder alterants, as arctium and alnus, may be employed, with such alterant stimulants as guaiacum or mezereon added. The eupatorium purpureum or apocynum cannabinum may be incorporated when there is a prominent inefficiency of the kidneys, euonymus or juglans when the biliary apparatus is feeble, and iris versicolor, in small proportions, has a very marked influence upon the liver, kidneys and lower bowels. Sirup is the best form of exhibition and large quantities should be used. Occasional vapor baths, daily and thorough ablutions of that temperature which is most agreeable, a largely vegetable diet and abstinence from tobacco and coffee, a healthy locality, with plenty of sunlight and fresh air, are the hygienical means to be positively insisted upon. And this management must be pursued perseveringly—months being usually required to effect a cure. And when the ulcer has all been healed up and would seem as if wholly terminated, the constitutional treatment should still be continued to the eradication of the scrofulous taint, if possible. Less than this can scarcely be called a cure; for the mere cicatrization of the sore does not imply its obliteration, nor should it deceive us into the belief that it may not return as long as the blood is charged with the degenerate albumen of struma.

In beginning the local treatment, the first thing to be advised is rest; and this must be enjoined, when the patient's circumstances admit it, during the whole continuance of every large scrofulous ulcer, a part of each day being appointed for out-door exercise of some moderate kind.

The first end to be attained, by the local applications, is the removal of all the thin, blue integument and adjacent structures—which can not possibly be made sound and are sources of mischief as long as they remain attached to the healthier structures. The parts must be rid of them as soon as possible and every aid rendered to the vital force to cast off the whole degenerate mass. Large poultices of bread and milk, thickly compounded with capsicum, are about the most efficient means, and serve to arouse a good vital action in the parts capable of it and thereby build up a firm plastic layer between the living and the dying, by which the latter will be speedily removed. Such poultices are to be freely applied at the outset and should not be stinted on account of the acute sensation they may arouse. A good scarlet redness around the livid flesh tells that the requisite vital effort has been established. When a lively arterial action through the living and sound parts has been secured, the amount of stimulus in the poultices may be greatly diminished; and then, over the whole of the surface which is pale and translucent, a thin layer of moistened podophyllum may be laid (and this whether the skin is abraded or not) and a mildly stimulating poultice spread over and beyond that. The podophyllum will soon destroy the tissue and either lead to an actual slough or cause rapid suppuration with a profuse discharge. The application may be continued till a sound surface is found underneath, when it should be at once discontinued. In a great many mild cases, the podophyllum may not be required.

Other stimulants than capsicum may be used in the first poultices, as xanthoxylum or myrrh. Mustard is used, but is not as good as the others. We have made a simple poultice of flaxseed and smeared it *very* lightly with oil of capsicum, and with the most happy results. From two to twelve hours may be required to secure a full arterial action around the part, but of this the practitioner must himself judge according to the evidences before him. The stimulants may be required for many days after this first application, or this one may prove so efficient that no further excitation may be needed to stir up the vital power.

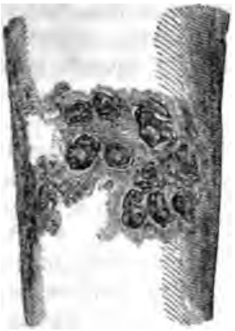
A good large slough, even if it should enlarge the circumference of the original sore many diameters, is the end desired; but, as was first said, an extension by suppuration may be all that can be obtained. When, by either of the above modes, the livid and half-dead mass has been removed, a good surface of granulations will probably be found below. The sore is now in a condition to be treated with the intention of healing. Water dressings are to be used if the sore appears of the *simple* or healthy character; the mildest stimulants and relaxants if of a *weak* type, and the more positive stimulants if it continues of an *indolent* quality. Cicatrization is usually secured without much difficulty after the removal of the corrupt mass, though much patience and an uninterrupted use of the constitutional treatment are required. All scrofulous sores are tedious of management and this low form of ulcer is indeed stubborn of removal. Nine months or a year may pass before a cure can be affected.

Cachectic Sore.

The cachectic form of ulceration is usually made to embrace all those sores upon the surface which come from either mercurial or venereal virus. We propose, in this connection, to consider those which arise alone from mercurial poisoning, leaving syphilitic ulcers for full consideration in the chapter on that subject.

The calomel ulcer resembles the scrofulous in its peculiar degeneracy, the openings being numerous and usually having a sub-cutaneous connection; the skin slightly swollen and dusky; the discharge serous; pain acute; bottom of the sore ungranulating, mostly red and presenting an appearance of half-rotted fibers ready to break down upon the slightest touch; limb wasted and the sores advancing from point to point—a new one appearing as an old one cicatrizes.

FIG. 10.



Cachectic Sore.

TREATMENT.—The cure of these ulcers is, perhaps, more difficult than that of any class—the rotting character of the mercurials, when lodged in the tissues, rendering the eradication of these sores a tedious and laborious process. The main anchor of reliance is in thorough and constant medication of the constitution, with attention to every hygienic law and respite from mental excitement and hard physical exertion. The extraction of the mercurials by the use of the electro-chemical apparatus (see Caries of Bone) is a promising means of securing favorable cicatrization and is, perhaps, to be relied upon with as much certainty as even the constitutional treatment. Frequent vapor baths are not to be forgotten, but should be used from the beginning to the termination of the treatment and, indeed, long after the sores have been closed—a person who has once been cursed with a mercurial ulcer being scarcely ever after in a condition free from similar outbreaks. The dressings upon the sore are usually of the simplest kind—simple cerate, ointment of sambucus, celastrus or baptisia, elm poultices, with such variations as the irritability or non-irritability of the surface may require, are all that are needed. In some cases, entire success seems to crown these efforts; again the ulcers may so spread as to render amputation of the part necessary; and, if they are so situated that the knife cannot be used, the life of the patient may be the penalty of this impregnation with one of the most inveterate poisons of creation.

Irritable Sore.

"This sore," says Professor Miller, with his usual perspicuity, "is almost invariably superficial—not penetrating more deeply than the true skin. In fact this texture may be said to be the peculiar site of this class of ulcer; and the circumstance may in part account for the great sensibility of the sore. The surface [of the sore] is unequal; deeper at some points than others. It is void of granulation [or, at best, has granules of a very diminished size] and either of an angry, dark red, fleshy hue, or covered with a grayish film of tenacious aplastic fibrin. Sometimes this covering only partially invests the surface; which then shows both the red and gray appearances. The edges are thin, serrated and everted; of a red, angry color and sometimes studded with brightly florid points, as if of arterial blood. The surrounding skin is slightly swollen and also of a dull red color—being in a state of passive congestion [the blood actually stagnant]. * * Discharge is thin, acrid, bloody; often mingled with solid matter, either recently exuded or the result of disintegration in the primary textures. Pain is constant, always considerable, often excessive. The slightest interference with the acutely sensible surface is followed by a feeling of intense burning and by a copious flow of blood, usually of a dark grumose character—as if the injury were resented, instead of being merely acknowledged as in the healthy sore. Generally an irritable state of [the] system precedes and accompanies this state of the part; and, even when no such predisposition exists, that morbid condition of system is almost certain to occur—an example of constitutional, induced by local, irritation. Along with the ordinary symptoms of the constitutional form—more especially restlessness, want of sleep, loss of appetite, emaciation and general disorder of secretion—there is often a remarkable peevishness of temper unhappily combined."

In the section upon *Irritation* we have fully discussed the nature and meaning of this vital symptom or manifestation: an irritable ulcer is a circumscribed epitome of the same exalted sensation there analyzed. There is an excess of feeling and a corresponding exaltation of arterial effort, but a deplorable insufficiency of power; a marked want of strength and a deficiency in plastic material with which to make granules of a proper kind. There is, as it were, a *will* to do, but no ability to perform. The tendency to congestion is also very marked, although so superficial; and the quality of the blood seems to be itself altered and degenerated, appearing ready to liquefy and rot even while yet in the vessels. These several circumstances make the truly irritable ulcer formidable to manage—there being such a constant tendency to extensive sloughing and the general health failing so rapidly in consequence of the excessive pain. Fortunately, this form of sore is of comparatively rare occurrence and is scarcely found when the treatment of the simple ulcer (to which it usually succeeds) has been properly managed.

TREATMENT.—Here, as in the indolent ulcer, we would begin the treatment with constitutional means; or, at least, place the general exhibition of remedies upon a plane with the local applications, and by no means place entire dependence upon the latter. The agents employed are to be of the diffusibly stimulating and relaxing kind—the true nervines, those which soften at the same time that they sustain the acting capacity of the nervous system. The philosophy by which such agents are selected has already been fully explained (see *Irritation*). The mode of treatment which has been directed for constitutional irritation is here to be adopted and carried out promptly and energetically. General quiet is to be most strictly enjoined, fresh air secured and a wholesome diet provided.

The sore itself is to be managed by the application of demulcent and nervine poultices. Any of the ordinary demulcents may be chosen and asarum, salvia and mentha viridis, with zinziber, lavandula, crysanthemum, ruta graveolens and similar agents, intermixed in small proportions. Zinziber, aralia racemosa or eupatorium ageratoides, added to leontice thalictroides and *small* quantities of these mixed with ulmus, may be used in cases where the congestion is marked. The application of any of these agents will cause some tingling at first, but this usually passes away in a little while. It is well to apply some oily material to the surface, such as sweet oil, goose oil, olive oil and chalk and similar articles, previous to putting on a poultice. The quantity of the nervines put into the poultice may be much diminished in cases where the tenderness is extreme; and the mildest nervines, as spearmint and cimicifuga, are then best.

The cure usually begins to progress at once under this management—the pain abating, the congestion receding and the general arterial excitement becoming more quiet. Perseverance alone is required to relieve the parts from the threatened destruction and restore them to a proper granulating capacity. As the irritability becomes less and the sore approaches the condition of the *simple* ulcer, the treatment must be proportionally modified; if there is a tendency to degenerate into the *sloughing* sore, the appropriate stimulants must be at once applied.

Inflamed Sore.

This variety of ulcer is accompanied by considerable inflammatory action and a continued advance of ulcerative destruction. There are no granulations, but a profuse molecular effusion, which at once passes into decay and forms a large purulent discharge of an unhealthy character. The surface of the ulcer is raw and soft, or pulpy, to the touch; the margins are angry, hot and painful, and the adjacent structures are inflamed and exhibit all the appearances belonging to that action. Determination to the part is very great, causing much intense pain and rendering motion and an erect posture quite insupportable. The whole vascular apparatus inclines to sympathy with the local effort, and fever of an inflammatory grade is a usual accompaniment.

The inflammation, as we know, is not in itself destructive, but is established for the purpose of checking the progress of decay. Its existence, here as elsewhere, proves the presence of some acrid substance that is inimical to the integrity of the parts. These provoking and injurious materials usually consist of the gross and poisonous elements of unperformed secretion or the presence of mechanical irritants upon the surface. The existence of over-sensation and a want of nutritious elements, out of which to form healthy granules, will also lead to this variety of sore, the blood rushing to the part in excess, the capillaries being too feeble to carry it around and the effusion being of that low, aplastic quality that can not possibly be made into sound integument. Excessive stimulation of any of the preceding varieties of sores, by being continued beyond the period that requires stimulus, will develop an inflammation, and the inability of both the parts and the blood will make it impossible for that inflammation to accomplish any sanative result. Hence, while the establishment of an arterial exertion is requisite in the management of both the weak and indolent ulcers, undue excitation is to be avoided as likely to exhaust the parts and leave the blood to stagnate and the surface to decay still further, this being the stasis of inability which favors the progress of disintegration. It is very rare, however, that a sore of this character is met with, except when there is very marked obstruction in the alimentary canal and the foulest accumulations in the whole system, the vital effort failing to stay the destruction because the chemical has obtained the mastery over the vital power. The intensity of the life struggle shows the extent of the danger and the rapidity with which the decomposing influences are disposed to advance. On these accounts the inflamed ulcer is one of the most distinct illustrations of the even balance which sometimes exists between life and death, as also of the uniformity with which the vital principle will proportion its recuperative efforts to the magnitude of the danger.

TREATMENT.—This variety of ulcer is to be managed in every respect as if it were an inflammation set up for the removal of an obstruction in unbroken tissues. Tepid poultices of a demulcent and relaxing character, prompt unloading of the prima via by enemas and leptandra when necessary, ablutions or vapor baths to restore the equilibrium of the blood by inviting it toward the whole surface, relaxing drinks in abundance when the general circulatory apparatus becomes rigid and then strict quiet and an elevated posture of the ulcerated part. The particulars of the management will be found in the sections upon Inflammation. A very few days—perhaps, at the outset, a few hours—will be sufficient to relieve the parts and let out the morbific accumulations, when the pain and tumidity will subside and granulation will again commence. The sore is then to be treated by demulcent poultices or water dressings, as in the simple ulcer.

Phagedenic Sore.

Any of the preceding varieties of sores may degenerate into that degree which approaches gangrene or death by a succession of sloughings. This form of ulcer is known as the phagedenic. The advance is rapid and most obstinate; the edges of the sore are irregular and ragged; the surrounding integuments swollen, red and painful, giving evidence of a low grade of inflammatory action; "raw surface of a brownish hue, totally void of anything like granulations, of uneven depth and in many places presenting the appearance as if gnawed by the teeth of a small animal." The blood in the capillaries inclines to putrescence, the system is very much enfeebled and a low constitutional irritation exists.

The phagedenic sore so nearly approaches the sloughing of gangrene, so speedily passes into it and requires such analogous treatment, that the management will be reserved for the chapter on Gangrene.

Peculiarities of Ulcers.

The forms and varieties of ulcerous appearances might very easily be continued to a much greater length—there being an almost numberless diversity of appearances, connections and conditions, to these open suppurating surfaces. But the plan of generalization brings the majority of them into classes, which, though they can not be made to embrace all the anomalies that will be met in the course of a surgical practice, are sufficient for all practical purposes. To extend the number would only be to add confusion to what is already intricate enough. As the practitioner must always use his own judgment in classing the sore before him—placing it at that point in the scale of gradation which the majority of the symptoms warrants and scarcely expecting to meet with an ulcer in all respects corresponding to any of the typical divisions—he must also use his own intelligence in adapting his treatment according to any strange peculiarities he may meet in an individual case. If the principles of ulceration are first understood and the importance of the different vital manifestations made familiar, there will be but little difficulty in referring any minor anomaly to its proper place and meeting it with appropriate medication. Yet a few of the more usual variations found associated with ulceration may be alluded to in this connection.

Varicose veins are a most common accompaniment of ulcers—especially of those situated upon the extremities, as a majority of them are. Varix may, and frequently does, give rise to ulcerous destruction, yet the sore may have a prior existence and the swollen veins succeed it. Every one of the previous classes of ulcers may be thus accompanied; we say "accompanied," for this is not a distinct variety of ulcer, although it may prove a most disagreeable companion. The reason of the varicose association is easily found in the fact that congestion is the condition of varix and the forerunner of ulceration—there being a stasis (more or less complete) in both cases. In the ulcer there is the greater liability to death, because of the weaker circulating power of the capillaries; in varix the size of the blood vessels enables them to continue a meager flow, which is just sufficient to thwart actual destruction. The treatment of an ulcer with such a connection is to be in all respects the same as if the varix were not present; and, if the enlargement of the veins should increase or protract the destruction by giving a greater tendency to stasis, the varices are to be managed as if they were not thus connected with a sore (see Varicose Veins). The complication is a very unpleasant one and renders the chances of cure fewer than where there is no such accompaniment.

Sinuous and *Fistulous* forms are sometimes given to ulcers; or perhaps it is more in accordance with science to say, that the sinuses and fistulæ resulting from suppuration do not become covered with a pyogenic membrane, but assume an ulcerous character. These (as also the more simple and superficial sores) may be occasioned by the lodgment of some solid material, as of wood, stone, metals, &c., introduced from without and detached spiculæ of bone within. All such solids are to be removed and then the case classed and treated as if they had never been present.

Poisoned sores are very common and some of the most baffling ulcers are of this kind. The virus may be vegetable, as of the rhus toxicodendron, or animal, as dissection virus and the putrescence of hospital and venereal virus. Such ulcers are always of a most formidable character and incline very rapidly to the phagedenic class; the virus is absorbed, decomposition is extensive and death strongly probable. But each of these will be mentioned at the proper places through this work—their importance and peculiarities demanding distinct consideration.

Menstrual or *Vicarious* ulcers are occasionally met on the legs, or even on the bodies, of women afflicted with catamenial irregularities. The monthly flux being wholly (or partially) suppressed, these ulcers will form at what should be the regular menstrual period, enlarge suddenly, discharge large quantities of thin and foul matter or blood and then disappear between the monthly turns. They are palpably connected with the condition of the uterine organs and can only be relieved by regulating the catamenial function.

Malignant ulcers occur in connection with *Cancer*, under which head they will be treated.

CHAPTER IV.

GANGRENE.

Gangrene in General.

DESCENDING, in the scale of decomposition, below the phagedenic form of ulceration, we meet with that degree of decay known as *Gangrene.* The parts destroyed, instead of dying by molecular liquefaction (as in suppuration and ulceration), pass off in a series of putrescent sloughs. These sloughs usually begin upon the free surfaces, from thence advance to the more deeply seated integuments and are limited in extent only by the ability of the system to build up a plastic wall of arrest. The soft structures, the muscles, the ligaments and even the bones, are liable to this degree of destruction, the progress of which is more rapid than in ulceration. This chapter will be more particularly devoted to gangrene in the cutaneous and sub-cutaneous tissues, where it is typical of the same degree of chemical decay in all other parts.

Gangrene, like suppuration and ulceration, has its immediate commencement in congestion and failure of nutrition in a part. Impediments to a free circulation having existed and an arterial effort for their removal having been established, the failure of that effort leaves the part at the mercy of the chemical power. The scarlet hue of inflammation is changed for the livid tinge of stasis; the resisting fullness of plastic effusion is lost and the quaggy feeling of fluid infiltration is found in its place; the elevated temperature resulting from increased arterial friction gives way to the coldness of inaction and the exalted sensibility of well nourished nervous extremities disappears in the total inanition of local death. These are the first evidences of the approaching destruction. As decay advances, the color becomes greenish brown or almost black; the marshy feeling increases to a very decided pithiness and softness; sensibility is so completely lost that even rough handling, or pricking, causes no pain; the temperature is diminished much below the normal standard of the body and everything gives unmistakable evidence that the part is dead. The structure thus deprived of vitality soon begins to soften; the blood in its vessels liquefies; a clamminess is commonly found upon the surface; a mild grade of inflammatory action is established around it, throwing out a fibrinous wall of protection and separating the dead parts from the living by the exudation of molecules. By this means the whole surface of the gangrenous part is gradually loosened from the sound integuments and cast off, constituting a *slough*—of which there may be one or several, according to circumstances which will be hereafter mentioned.

As gangrene is almost invariably surrounded by a greater or less degree of inflammatory action, it has usually been considered as a result or direct product of the arterial excitement. That the slough is cast off by means of this vital exertion is readily seen; for, unless the living part protects itself against the contamination of the putrefying mass, by establishing an inflammation and building up a separating wall, the consequences to the whole system could not fail to be of the most disastrous character. But that the decay is itself caused by the vital effort has already been shown to be a fallacious conclusion (see chapter on *Inflammation*) and needs no further proof to demonstrate that it is an immediate consequence of stasis or congestion. It is very well known, that the more complete and sudden the obliteration of a flow of blood to a part, the more complete will be its destruction; and a *total* obliteration of the circulatory apparatus at once leads to perfect death, as in actual mortification. If it is claimed that the stasis is the inflammation, then we will coincide in the opinion that all degrees of decay result from that condition. But as action and inaction are opposite, the same term can not express both; and if inflammation is used to imply stasis, then a new term must be coined for arterial excitement. It is this confounding of two opposites that has led to misapprehension in regard to the so-called "terminations" of inflammation. By adopting the sense in which we have used this term, there would be no further occasion for misunderstanding.

The immediate procuring cause of gangrene is want of sanguineous nourishment. A part may be deprived of its proper supply of blood: 1st. By the introduction of any foreign solid or the accumulation of any internal morbific materials, as has been already mentioned in the section upon the provoking causes of inflammation and congestion. 2d. By ligation or other obstruction to the supply of the arteries (as the presence of tumors in some localities). 3d. By too tight bandaging, or too long confinement in one position upon a bed—by either of which capillary circulation will be cut off. 4th. Obstruction to the return of venous blood. 5th. Cold of an intense degree, as when a part has been frozen. 6th. Mechanical injury, as heavy blows and other violence. 7th. An interruption in the function of the efferent nerves, whether by ligature, pressure or structural change. In every case, however, great constitutional disability is prominent and has much to do, not with producing, but with allowing this complete grade of chemical destruction. Feeble persons are much more liable to gangrene than those of hardy and robust frames a condition which would be speedily removed in the latter often leading to most serious consequences in the former. In like manner, those parts of the body which are most remote from the heart, as the extremities, are most frequently the seat of decay; and the enduring structures, as the ligaments and bones, resist gangrenous destruction much longer than do the skin and areolar tissues. The nerves and arteries seem to enjoy a special immunity from destruction and illustrate the perfection of the organism—it being no uncommon thing to find a huge slough traversed by living arteries in full beat. Yet these ultimately yield to the destroying influences—their severance hastening death by the consequent hemorrhage, which is usually of a most ungovernable nature.

When the difficulty refers wholly to a remote portion of an extremity, destruction may go on for some time and spread over a considerable surface without any sensible efforts at resistance on the part of the whole system. But in most instances a febrile attempt at opposition is made. This effort is usually of the low type known as the irritative, or it may be even of a typhoid character in very feeble patients. When gangrene occurs internally, the constitutional effort is much more likely to be made than when it occurs externally. The grade of the fever, however, is usually of the lowest kind—the real typhus, with a wavering, thready pulse and frequently wandering mind, heavy sordes upon the teeth and a pungent heat upon the skin. "A sudden cessation of pain, with hiccough, vomiting and tympanitic distension of the abdomen, may be superadded to the symptoms and indicate the mischief that has occurred. Death usually supervenes, with low delirium, twitchings and coma" (Erichsen's System of Surgery, p. 341).

Sloughing Phagedena.

Sloughing phagedena is, as it were, a combination of gangrene with the phagedenic grade of ulceration. It has very commonly been described as *Hospital Gangrene;* and, though there are several differences between the two, they may be best considered as one, being more like varieties of the same thing than distinct general points in the scale of decomposition. Phagedena is of very sudden accession, mostly attacking fresh and healthy sores, advancing by most rapid sloughing and destroying every thing before it. Sloughing phagedena usually begins in a small, grayish brown spot near the edges of the sore. Sometimes the whole ulcerous surface will be studded with these; again but two or three will appear; and, in some instances, the spot consists of a blackish-brown vesicle which ruptures easily and discharges a kind of grumous blood. In whichever of these ways it may begin, the spots enlarge and soon occupy the whole included surface, constituting either an ashy-gray or a grumous-black mass of decomposed structure, which adheres persistently to the healthy parts underneath. The appearance of the points, or vesicles, is cotemporary with the most intense burning pain over the sore, the patient at the same time becoming very irritable and restless. The process of decomposition advances deeply among the tissues and also spreads superficially. The surrounding integuments become livid, a low grade of inflammatory effort is established and the effusion of aplastic material gives an edematous feeling to the parts. The edges of the sore are sharp, everted and circular and the ashy slough lies in the cavity like a pulpy, semi-gelatinous mass. Or, if the decomposition is of the lower grade, the aspect of the sore is brown, almost black and a putrid stench arises from it, at the same time that a dingy ichor mixed with blood oozes out slowly upon the surface. When the gray slough is found, there is a diminution rather than an excess of discharge.

There is always an ardent constitutional sympathy with the threatened part and a febrile action will be established for the purpose of rendering aid. The grade of the arterial effort, however, will be among the lowest, the body seeming to be too depressed to arouse itself to an efficient struggle against the encroachments of chemical power. The pulse is thready and flickering; the skin is pungently dry, though sometimes clammy and cold, while thirst indicates an internal acceleration of the blood; the head is dizzy, the mind often confused and the whole nervous system extremely sensitive. In short, the febrile effort is of that quality known as the *irritable*—a crusted or brownish tongue and sordes upon the teeth showing the tendency to typhoid prostration.

The extent of the destruction is very various, at times not advancing beyond a circumference of a few inches and only affecting the more superficial structures; while again it will be found spreading over a large surface and burrowing almost, or quite, to the bones. The period occupied is also uncertain, a week or two weeks being occupied in some cases, while in others a single day suffices for the commission of most alarming ravages. The first slough usually comes away within five days, but more commonly within three days. If decay has advanced deeply, the cellular tissue, muscles and tendons, will alike fall before its ravages; but the arteries will resist the longest and are not uncommonly found pulsating through portions of the slough, or at the bottom of the sore, after the dead mass has passed away. The slough, as has been already said, adheres tenaciously to the sound integuments underneath, the dying structures seeming to advance and take root among the living parts, contaminating them with the virus of a hasty putrescence. When the slough has been finally detached, a tender, granulating surface appears underneath. In the cases of gray slough, it is not uncommon to find these granules quite tractable to medication, and careful treatment may so further their organization as to at once resolve the difficulty into a simple sore, which will be healed up readily. But when the slough is brownish black the granules are very feeble, bleed upon the slightest and most trivial provocation and, instead of advancing toward tissual formation, soon pass into another slough, by a succession of which the gangrenous destruction may be rapidly extended and the patient's life endangered. Sometimes the detachment of the slough will tear away the walls of an artery and the most unmanageable hemorrhage be added to the difficulties of the occasion.

The sources of this grade of death are undoubtedly to be looked for in the contamination of poison. This may be a specific virus, as in the sloughing phagedena known to follow the contact of very degenerate venereal virus; or it may be of a general character, resulting from filthiness; or the loaded atmosphere of crowded surgical wards may become the occasion of its development. The discharge from any degenerate sore may, by direct contact with a perfectly healthy sore, cause the latter to pass into a sloughing phagedena, and the penetrating fetor arising from a single case of true hospital gangrene has been known to infect every ulcer in a large ward. Such observations prove this form of decay to be contagious and make its epidemic prevalence a matter of great probability. Fortunately it is a form of destruction seldom met with in private practice.

TREATMENT.—It will be apparent to every practitioner that the treatment of sloughing phagedena must be of the most thorough and vigorous character. For convenience, the management may be divided into three heads: 1st. The prophylactic. 2d. The constitutional. 3d. The local.

1st. Prophylaxis, both with the intention of preventing the degeneracy in any case and checking its propagation after its accession in one, is evidently of paramount importance. No degree of cleanliness is too great and, in hospital practice particularly, the most scrupulous minutiæ of scrubbing, white-washing, and ventilation must always be attended to. Fortunately the modern regulations of these public charities are so excellent as to almost exclude the possibility of this degeneration of healthy ulcers, and the ravages of hospital gangrene are now almost unknown. But in private practice it is still met with occasionally, the gross carelessness of both patients and surgeons permitting an accumulation of personal and surrounding filth which can not but lead to the most injurious results. To avoid such consequences, it is imperative upon the practitioner to guard against every uncleanness and to pay the most scrupulous attention to the dressing of *every* sore, that he may not have the unpleasant imputation of carelessness resting upon him. The means of cleanliness are, of course, understood by all and we need not do more in this connection than to insist upon their unrestricted use in every case and under all circumstances.

2d. The constitutional treatment should be of the purifying and sustaining character. The diffusible stimulants are to be used freely from the very first and the decided stimulants may be called for. Begin immediately by securing a thorough unloading of the bowels, using enemas of lobelia and ginger in water of elm or starch. Let the clysters be large, tepid and administered frequently till they are returned from the bowel free of feces. If there is a coating upon the tongue, a searching emetic must be given without delay, using zinziber and myrica for a tea, making the infusion weak and drinking freely. The perfect clearing out of morbific accumulations by such an emetic, or even by its daily repetition, can not be neglected with impunity, and no objections should be allowed to deter the practitioner from its use whenever the state of the tongue clearly indicates its necessity. The bowels, in their upper portion, may then be further moved by moderate doses of leptandra or euonymus (avoid podophyllum, jalap and similar irritating agents) and the daily use of a tepid water clyster, or a stimulating enema when required, will keep the prima via free. At the same time let the patient drink freely of sage, spearmint and similar aromatics, keeping the skin moist and the system well supplied with fluids thereby. When the pulse becomes small and thready, employ asarum, zinziber, hedeoma or polemonium, as drinks; arum, eupatorium ageratoides and aristolochia may also be used; small portions of carbonate of ammonia will sustain flagging strength and minor quantities of capsicum may be added to any of the above teas when the patient becomes prostrated or shows signs of collapse. We say, again, let the quantities used be sufficient to sustain that flow of blood toward the surface which will lead to a gentle perspiration; for upon the maintenance of the arterial circulation will depend the whole future. Rest and quiet are also to be enjoined and a generous diet allowed.

3d. The local appliances should be of a stimulating and astringing character, being selected with the view of rousing that degree of local action which will be likely to cast off the slough and build up a sound layer of granules underneath. Relaxants and warm moisture are to be avoided as far as possible and astringents employed in their stead—for the loosening of the tissues will now further the advance of putrefaction. A strong infusion of capsicum and myrica may be made, a pledget of linen or a light layer of lint saturated with it and laid over the whole threatened surface. Or the finely pulverized articles may be moistened with water, placed in a thin layer between two very fine pieces of linen and then laid over the parts or around the edges of the sore. In like manner, xanthoxylum, myrrh and arum, may be used as stimulants and geranium, quercus and rhus cortex, as astringents—being compounded at pleasure and as may be deemed most applicable to particular cases. Nitric acid, sulphate of copper, nitrate of silver and similar abominations, are recommended by most works upon this point, but they are worse than useless and do not deserve to be thought of for a moment. A favorite mode of procedure with us, is to wash the edges of the sore well with the compound tincture of myrrh (pure or diluted as may be required), afterward putting on a powder of capsicum, myrrh and myrica, mixed in equal parts and properly moistened with water. This will most surely arouse a good vital action in all cases where there is life enough to respond. In many instances, one appliance will be sufficient to secure the detachment of the slough, while in others a renewal of the wash and powders will be required several times, at intervals of about six hours, though ten or twelve hours may sometimes be allowed to pass without any disturbance of an application. The slough will begin to separate at its edges, but should not be hurried off by artificial interference, as there will be imminent risk of breaking down arteries and thereby procuring the alarming complication of hemorrhage. It will be sufficient to cleanse the surface carefully, remove all foul moisture and lessen the stimulating power of the appliances in proportion as they are found to have procured a good vital action.

There are cases of sloughing phagedena in which the application of much stimulation will over excite the nervous peripheries and increase the irritability of the patient. These cases are better known after the trial of exciting measures than by any definite description that can be given of them. Generally speaking, however, they can be known by the somewhat ragged edges of the sore, a scarlet rather than a livid areola and a tendency to arterial hemorrhage. The use of the myrrh wash is then useful, as before, and yeast mixed with nymphea odorata will form an excellent application for favoring the displacement of the slough. Many use yeast alone for this purpose; malt is also employed and we have used small quantities of powdered charcoal, in combination with mashed raw carrots, with most pleasing results. Care is to be taken here, as elsewhere, to avoid the retention of too much moisture in the appliances, for which end they should be mixed stiffly and made as small as possible.

When the slough has separated, the granulating surface underneath is to be managed as in any other case of ulcer. If it is a perfectly healthy sore, tending at once to reparation, employ the lint and water dressings, as has been elsewhere advised. And in like manner treat it as the irritable or weak sore, if it falls under either of these classes. Most cases are, very fortunately; of a pretty healthy grade, and if the decomposition by slough has been successfully forestalled and the system well rid of morbific materials, cicatrization will advance rapidly.

The occurrence of ordinary hemorrhage is usually checked without much difficulty by sprinkling some such astringent as geranium, rhus or quercus, upon the surface. Myrica answers an excellent purpose, and pure tannin, or gallic acid, may also be used. If it is a considerable artery that is ruptured, the ligature must be used; and, if the rottenness of the coats of the vessel makes this unavailing, the actual cautery must be applied. There are times when all these means will fail—the loss of blood continuing unchecked and death becoming inevitable. Amputation is then the only resort and must be employed promptly—the sooner the better after the proper means for stoppage have been found unavailing. This is a fearful alternative and one which the surgeon will avoid as long as possible; but when it becomes apparent that the loss of blood is not to be checked, the absolute certainty of death from hemorrhage makes its employment a necessity, and this becomes one of the occasions when all the skill and decision of the practitioner will be put to the test. His own judgment of the case, as it stands before him, must decide his course of conduct. Fortunately, these instances are of rare occurrence, and, when a case has been well managed by the stimulating and astringing means above described, they are so *very* rare that a whole life in an ordinary practice may be passed without meeting with one.

Mortification.

Mortification is that form of gangrene in which the death of a part is complete. It stands at the very foot of the scale of chemical decomposition—being perfect and total death, without the intermixture of any living fibers as is the case in simpler forms of gangrene. All the structures in the dying part alike yield to the power of chemical degradation, cellular, fibrous, ligamentous and osseous formations giving way before the circumstances and influences which cut off the supply of life.

In mortification (also termed *sphacelus*), the destruction commences in the softer structures, but ends in the putrefaction of the whole. The ordinary appearances of congestion and serous effusion are first observed; then the temperature and feeling of the part are lost; and it finally becomes perfectly cold and insensible. It usually assumes a dark brown, or black, hue, though, under some circumstances, the appearance is rather whitish and the under layers of the slough may be found to retain nearly their natural color. The part shrinks; becomes soft and pulpy and is observed to contain not only fluid effusions but the gaseous product of decomposition. The part being thus wholly deprived of vitality, an inflammatory action will be established in the tissues adjacent to it; and nature will, according to her ability, build up a fibrinous wall known as the line of demarkation. At this point the destructive process usually terminates and it is very rarely that mortification extends beyond it. The place at which nature will thus establish her limit is, however, a matter of much uncertainty. Sometimes the portion destroyed will be but trifling and a close wall will be built around it at an early day and only an insignificant part of the structure will be lost. But too frequently the destruction advances to an alarming extent; and, when the extremities are concerned, it is no uncommon thing to have the limb completely amputated by the process of decay and a circle of lymph effused at some high point after it is evident that the limb can in no way be saved.

The progress of sphacelus is usually quite slow, the decay advancing by leisurely steps rather than by sudden and rapid strides. The decayed parts, too, are slow in falling off, seeming to be waiting for the entire demolition of every structure within the mass before giving up their hold upon the tissues beyond. This is very fortunate for the patient, as it gives the life power an opportunity to build up a firm plastic wall and secure the mouths of the large blood vessels, so that, when the slough does separate, there is scarcely any liability to hemorrhage and the lymph dyke is in a proper condition to proceed at once to the cicatrization of the sore. The process of separation is performed in the same way as in other forms of gangrene, namely: by the effusion of pus granules between the living and dead parts, by which they are loosened from each other and the dead washed away, leaving a healthy granulating surface behind. We will presently see, however, that there are many variations in this as in other forms of destruction; and the character of the causes which lead to the death, have much to do in determining its extent, the time occupied, the appearances and the mode of separation.

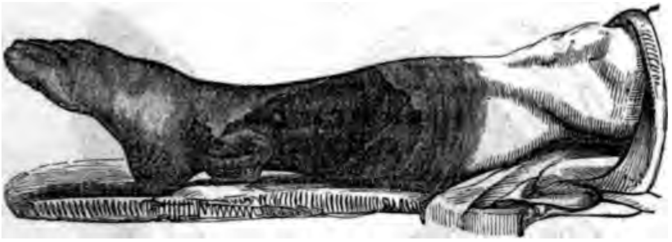
The constitution can not but suffer very much in all cases of considerable mortification. At first there will be an ardent febrile action of the inflammatory type, nature arousing herself with the utmost energy to overthrow the chemical enemy and protect her domain. But the task is too great and the energetic effort soon subsides into that which denotes a typhoid condition—constitutional irritation being at the same time very marked. Upon this point Mr. Travers holds the following expressive language: "The pulse is increased in frequency and diminished in diameter and force; in many cases irregular and in some intermitting. A peculiar anxiety of expression appears in the physiognomy and a remarkable livor overspreads the face, the features of which (the nose and lips especially) are contracted and pinched. The anxiety is soon exchanged for a hebetude of expression, as if the patient were under the influence of alcohol or opium; involuntary movements and tremors affect the hands and fingers and frequent sighings are observed, which are broken by occasional hiccough. The inclination for food fails totally, the surface of the tongue is coated with a brown fur, harsh and dry, leaving the edge and tip free, but without moisture. As the case advances, the entire tongue, fauces and lips, become dry to incrustation, so as to require constant moistening; but with small quantities of fluid, for swallowing is slow and attended with difficulty. The skin, which in the outset was dry, opens to a copious but clammy perspiration over the whole surface. It parts sensibly with its temperature and feels cold as well as damp. The mind, at first irritable—then, after the total subsidence of pain, stupid—wavers and becomes subject to illusions, chiefly of a passive and transient kind, expressed by half sentences with a thick and broken articulation and accompanied with startings and a momentary gleam of insane excitement. In traumatic gangrene—the age and constitution being previously in full vigor—this low delirium is exchanged for fits of active and wild phrenzy, accompanied with loud cries and vehement efforts, requiring a powerful and continued restraint; and this continues, with occasional intervals from exhaustion, for hours together; and subsides, often suddenly, in prolonged coma and apoplectic death." All these constitutional evidences can not be looked for in every case of mortification, but the majority of them are present in nearly all instances where the extent of the destruction is considerable.

The progress of mortification, as relates to the time occupied in the destruction, is familiarly divided into the acute and chronic. The *acute* form is altogether most frequently met with and is invariably accompanied by a greater or less degree of surrounding inflammation, the life power laboring protectively from the very outset. Associated with this inflammation is the customary effusion of serum, which softens the slough as it comes away—from which circumstance this variety has also received the names of *moist* and *humid* mortification (or gangrene, by those who make no distinction between the two grades of destruction). In the *chronic* form, there is rarely any trace of inflammation, but more usually an obliteration of all circulation—the parts becoming shriveled into a horny-like substance. This variety is void of moisture, is termed *dry* mortification and the decayed portion is called an *eschar*. It is much less common than the humid or sloughing form of mortification.

Mortification is always a direct sequence of deficient circulation and evinces decided constitutional inability; the loss of the nourishing fluid leaves the parts devoid of life and hence they must fall under the chemical power. This deprivation may be the result of various influences, among the most prominent of which may be mentioned the following:

1st. MECHANICAL INJURY, as extensive bruises, contusions, lacerations and wounds of various kinds, which break down the tissues and so impair the blood vessels that the vital effort at restoration proves abortive and the congestion of blood inevitably leads to destruction of the integuments. This result is always to be apprehended in violences of much magnitude.

FIG. 11.



Mortification after Compound Fracture; spreading; no line of demarcation.—Liston.

2d. Pressure, especially when made upon the arteries and veins. The venous return may be prevented by too tight bandaging or by too steady confinement in one position (see Bed Sores). Or either set of blood vessels may be seriously obstructed by degeneracy and coagulation within themselves or by the pressure of a tumor at any point. If the arteries are obliterated, the destruction is slower, accompanied by but little if any inflammatory resistance and usually forms an eschar. If the impediment refers to the venous trunks, the arteries are left free to make an inflammatory opposition, the effusion is considerable and death takes place rapidly. The same peculiarities are observed in mortification resulting from pressure upon the capillaries.

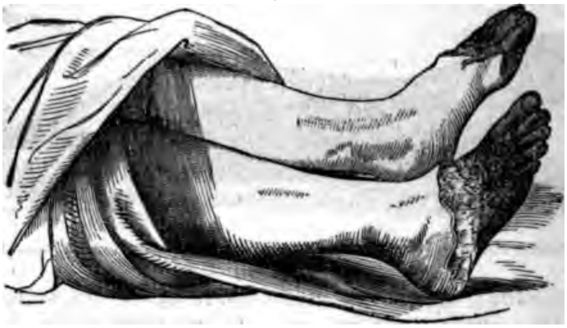
3d. Obstruction of Vital Transmission through the Nerves. This may be brought about by the same circumstances of pressure that cut off the free flow of blood; or it may be in consequence of actual severance of some considerable nervous trunk; or it may arise from actual paralysis. The destruction of tissue, under these circumstances, proceeds quite slowly and is more apt to be of the partially gangrenous, than of the true sphaceloid, grade. The parts wither very much, arterial and venous circulation fail and the decayed structures usually form an eschar, becoming dry, tough and horny rather than black, moist and spongy. This, however, is not a rule—the most extensive sloughs sometimes resulting from these impediments through the channel of the nerves.

4th. Excess of Heat and Cold, the influence and action of which will be more especially treated under Burns and Frost-Bites.

5th. Viri.—These, without reference to kind or mode of introduction, tend to so impair the nerves and blood vessels of the parts as to rapidly incline them to decomposition.

Their depressing influence upon the body at large also favors the local action of the chemical force, the life power being deprived of the implements for sustaining the vigor of the contaminated portions. The bites of serpents, the contagion of sloughing phagedena, syphilitic discharge of a very low grade, poison from a dissecting knife, extravasated urine and infiltrated bile, may all become sources of degeneracy and provoking causes of the most extensive destruction.

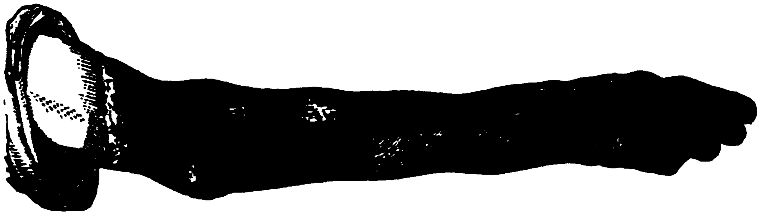
Fig. 12.



Mortification after exposure to cold; separation considerably advanced.—Liston.

6th. Constitutional Debility.—This is a most fruitful source of that physical degeneracy which terminates in mortification, and is found in nearly all cases of a chronic character as well as in many where the destruction is more acute. Indeed, there are very few cases in which general feebleness does not play some part in these destructions—the body being in that weakly condition which unfits it for the free nourishment of all portions of the tissues and renders it unable to make a successful resistance to the chemical influences. In those cases where no degree of constitutional vigor could have prevented the accession of decay (as in burns, frost-bites and great mechanical injuries), deficiency of vitality will allow the decomposition to advance over an alarming space. The feebleness may be in consequence of either foul air, unwholesome food, starvation, prostrating attacks of disease, hemorrhage or old age. Or it may arise from atrophy of the heart or failure of the larger arteries—influences analogous to those of the second class though acting in a more general manner. In the latter cases, as well as in cases where the debility of years is very manifest, the decay is peculiarly of the *dry* kind, the extremities (being most remote from the circulating center) becoming shriveled, pale, cold and ultimately horny—months being sometimes required for the completion of destruction, which is almost wholly unattended with pain or inflammatory effort. The same form of destruction is common upon the use of bad food, especially the ergot in rye; and the indulgence in intoxicating drinks for a series of years may become a source of the most alarming degeneracy of the whole body, which most directly favors the advance of mortification, even if it does not become an immediate cause of its commencement.

FIG. 13.



Chronic Mortification from debility and old age; line of separation begun; patient æt. 75.—LISTON.

TREATMENT.—When mortification has actually commenced, no mode of management can avail in saving the parts themselves, and all our treatment must be employed with the intention of preventing its accession or so fortifying the constitution as to nip its progress, obtain the early detachment of the slough or eschar and secure a good granulating surface underneath. All hope of restoring the portions in which decay has begun should be at once abandoned as futile and every effort made to save the body from suffering by the evil of putrescent contamination. The dread of destruction of tissue, under all the circumstances above enumerated, is so justly great among surgeons, that he does well who can so aid the life power as to effect the limitation of the chemical process. It is in these cases, as well as in cases of ulceration and gangrene, that the superiority of Physio-Medicalism is apparent—the means it directs being most remarkably efficient in saving uninjured parts from destruction, by setting up an early line of separation and invigorating the constitution so as to provide for a successful resistance to the chemical decay, which, left without interruption, or aided by poisonous professional interference, makes such frequent necessity for the knife.

Constitutional management, although not the most important in all cases, is yet of sufficient necessity to demand its employment from the earliest moment. The means used will depend entirely upon the state of the general health in each individual case. Where the secreting organs are free and the digestion good, nothing may be needed but some gently stimulating tonics, as hydrastis, populus, gentian or others which the practitioner may select. This course will continue to secure a good digestion and also sustain the arterial action, which is a point never to be forgotten in any case of mortification. In addition to this, the patient must be kept perfectly quiet, the bowels kept open by daily enemas of tepid water, the diet must be of the most wholesome and digestible character; and the diffusive nervines, as mint, asarum and ginger, should be employed freely as drinks to quiet all tendency to restlessness.

The digestive apparatus is most likely to fail first under the depressing influence of the destruction. Any loss of appetite, with fur upon the tongue and constipation of the bowels, calls for thorough emetics. The drinks used should be of a stimulating kind, as, equal quantities of asarum, zinziber and myrica, or Dr. Thomson's composition powder. The benefit derived from such an emetic is most cheering and can not be realized by the practitioner who is not acquainted with it by actual experience. One every third or fourth day is usually sufficient, though it may require repetition every day in serious cases. The enemas employed for the costiveness should be of a very gently stimulating character, as ginger and lobelia in a mucilage of elm. The bowels should not be allowed to remain unmoved a single day, otherwise mischief will surely result. Torpidity of the liver may call for the use of leptandra or juglans in addition to the enemas; and inefficiency of the kidneys is to be promptly and decidedly removed by the free use of galium, seeds of arctium lappa, or eupatorium purpureum, as may be deemed most suitable to the character of the case. The skin, too, will demand attention, and daily vapor baths and the use of diaphoretics should be insisted upon. No function is to remain unperformed, but every secernent must be kept properly open and means taken to secure the elimination of all morbific materials, by which course alone is it possible to preserve the body sound and in that vigorous condition which is so necessary to health under any circumstances and so indispensable in cases of mortification.

Besides the several above mentioned functions, the state of the circulation is a source of anxious solicitude to the surgeon; for, as long as the life power can keep up a free and equal flow of blood, all will go well; but, if the arterial apparatus fails in the performance of its duties, serious consequences are to be apprehended. It is most usual, in cases of mortification, to find a small and thready pulse with other evidences of depression and irritability. These must be at once met by the means directed from page 67–71. Ginger, asarum, polemonium and aristolochia, are among the most advantageous of the diffusible stimuli, and capsicum is best when something more permanent requires to be added to them. Aristolochia is very valuable on account of its tendency to expend its influence first upon the capillaries and arterial ramifications, and also for its direct exciting power over the nervous structures. Ginger is more pleasant, asarum more applicable when there is an evidence of irritability. Many others are open to the practitioner; but, whatever his choice, this diffusely stimulating plan of treatment should never be lost sight of.

The local applications should be mainly compounded of stimulants and relaxants—the latter to keep the blood vessels at a proper caliber and to favor the depurating action of the exhalants, the former to maintain circulation and sensibility. Such means may be employed in the form of lotion, fomentation or poultice, as may be deemed most desirable; but the simple wash is preferable, not retaining too much heat and moisture and being, therefore, more likely to allow the escape of the putrescent odor. The parts should first be carefully washed with weak and warm ley water, after which an infusion of lobelia and capsicum should be laved over them, a soft cloth, saturated with the same, wrapped about them and the whole lightly covered with a piece of flannel. The cloth should be thick enough and saturated often enough to keep the parts constantly moist; and it is not advisable, in most cases, to change it oftener than every six hours at the most, and twelve hours is more generally the proper period for removals. This last point, however, must be determined by the surgeon himself, the rule being to change the cloths only when cleanliness requires—not disturbing the parts too frequently, yet never running any risks from absorption of the putrefying discharge.

The third preparation of lobelia, as prepared by Dr. Thomson, is an admirable wash. Zinziber, xanthoxylum and myrrh, may also be used as stimulants in connection with lobelia, asarum, monarda or other relaxants and nervines. If fomentations are used, polygonum, arum, hydrastis and similar agents, may be employed, being compounded with small quantities of any moderate demulcent, as malva. Chelone and nymphea odorata made into a moderately moist mass and sprinkled lightly with myrrh, or myrrh and capsicum, form a valuable appliance to place upon the sound parts after the injured portion has begun to decay. The baptisia linctoria enjoys great repute in the same connection. Pulverized charcoal is often made into a poultice, with demulcents, to absorb the putrescence and act as an antiseptic. For the former purpose it is undoubtedly good, being also a gentle stimulant; but the successful appliance of this or any other article, with the idea of preventing the putrefaction of the parts which have begun to decay, may very safely be called in question. It is an object to remove these portions as early as possible, that their presence may not endanger the system by exposing it to the evils of absorption. For this end it is best to favor the softening of the slough, that it may be the sooner cast off—the constitution being thus left unshaken and a good granulating surface appearing underneath. As all antiseptics incline to an opposite result, their use may be most safely thrown aside; and we have found much better results from the employment of the purer relaxants and stimulants, than from any combination of preservatives whatever their character. When the brightening color of the surrounding live parts shows the establishment of a free circulation, and when the line of separation is set up and the sound integuments have begun to cast off the dead, the applications are to be more soothing and less stimulating. A light poultice of ulmus and mentha viridis, or of asarum, lavandula or scutellaria, added in small proportions to any of the demulcents, is then advisable. Tepid water dressings alone are sufficient in the more healthy cases, while as strong a stimulus as ginger may be needed with the demulcents in those cases where the sensibility and arterial action are still disposed to be of a too feeble grade.

As the sloughs become loosened, it is proper for the surgeon to remove them, if he can do so without any detriment to the living parts beyond. Let him, with a pair of delicate forceps, raise up the softened portion as far as he can and cut it off with a keen-edged pair of curved scissors. All tension or pulling of the parts to an extent sufficient to cause the least pain is wholly inadmissible, and the cutting should always be through the decayed mass and never, on any account, through any point which has vitality enough in it to either feel or bleed after the wound.

When the decayed portions have been removed, the circulation well established in the surrounding parts and a good healing surface left underneath, the case is merely a simple sore and requires only the plain local attention directed for the healthy form of ulcer. The practitioner must be watchful, however, lest some further trifling injury, lurking impurities of the system or insufficient arterial action, should result in a renewal of the destructive process, causing the parts to degenerate into a weak ulcer or a sloughing phagedena. Such accidents do not often occur under the vigorous appliance of the above mentioned means and, when they are met with, are to be relieved by the same local and constitutional management that has been directed under these two several heads.

Question of Amputation.—Amputation of some portion of the extremities may become necessary, in order to save the whole body from the destruction of mortification. This is more particularly the case in the threatened decomposition after severe mechanical injuries, after burns and frost-bites, and, sometimes, in chronic decay resulting from arterial insufficiency or other degenerating circumstances. It is the duty of the surgeon, however, to be slow in applying the knife in any of these cases; for, though great danger is always to be apprehended from the advances of the chemical process, the means employed in Physio-Medicalism are so potent for the establishment of a free, healthy action, as to almost do away with the necessity of operations. Let the knife be stayed, therefore, till it is evident that even the power of these means can not save the body from immense risks; then let it be employed with promptness and decision.

We are aware that this opinion directly conflicts with that of nearly all surgical authors and many will be eager to oppose our position. It must be remembered, however, that their directions on this question are based upon very different grounds from those which sustain us in our conclusions. The means they employ are of such a poisonous character as to be much better fitted to advance the progress of mortification than to check it. With nothing to rely upon and little to use but agents which are essentially destructive, it should not be expected that decomposition could be thwarted or stayed by such means, and amputation of the part is then the only safeguard for the remaining parts. But the agencies we direct are so well calculated to aid the vital power in retaining its hold upon the tissues, that no comparison can be instituted between the two modes of medication, and the rules founded upon observations in the employment of their means have no manner of weight in cases where our remedies can be brought to bear. Experience fully settles this point: for it would be a very easy matter to gather up a thousand cases where Physio-Medicalism has saved arms and legs after the most skillful Allopathic surgeons had pronounced amputation the only chance the patients had for their lives. Let our practitioners, therefore, be very slow to turn to their instruments and only employ them as a dernier resort; and he who rashly amputates before actual mortification commences, without making a faithful trial of the preservative remedies above directed, should, in all but the most fearfully extensive cases, be held under ban for an unprofessional sacrifice of the amputated member.

Yet there are times when even these means, however judiciously and earnestly employed, will not fail to prevent extensive decomposition—the injury to the parts having been so great that the excision of the member must be sooner or later performed. But even when it is evident that some portion will fall a victim to mortification, do not be hasty in applying the knife; for the above means may prove effectual in limiting the decomposition to so small a compass as to enenable the surgeon to save a goodly portion of the limb, and instances are not wanting where the decay was confined to one or two small sloughs, the whole member being ultimately saved. We have ourselves succeeded in effecting such results in two cases of injury to the knee joint and once in the elbow joint, in all three of which cases the approach of mortification had led well informed surgeons to decide upon amputation of the upper bones of the extremities. It is a good rule, therefore, to withhold the knife till the vital power (aided by the above efficient course of medication) shows a line of separation; the amputation is to be made above this line at a point far enough to form a stump that shall not include a particle of the corrupted integuments. Even in very acute cases, this rule is of service; for, if an amputation is performed previously to the establishment of such a line, the surgeon must either remove the limb at a point quite beyond the probable extension of the mortification or else run the unpleasant hazard of embracing some of the decaying parts in the flaps. If it is urged that nature may be unable to form such a line, even by the powerful assistance of a sanative medication, then it may be very safely called in question, whether the violence of an amputation will give any chance for saving a part which has not sufficient vitality in it to make even an effort at resistance to death. Yet these are questions which each surgeon must decide by his own judgment, according to the circumstances of individual cases—it being impossible to frame any rule of action which will hold good in all instances. Delay the knife as long as possible; but, when the whole, or nearly the whole, circumference of any point on a limb is falling a victim to chemical destruction, *do not put off amputation another moment.* The point at which the operation should be performed must, in all cases, be beyond the line of separation; or, if no such line has been set up, it must be performed beyond the limits of the hue of congestion which marks the probable extent of the destructive process. When removal is determined upon, it is better to take off a few lines too much than jeopardize the life of the patient by including a threatened point in the flaps of the stump.

CHAPTER V.

ERYSIPELAS.

Erysipelas in General.

THE term erysipelas is applied to an inflammatory effort in the cutaneous and sub-cutaneous structures, established in resistance to various poisons, the arterial excitement tending to spread over the adjacent parts and being accompanied by a peculiar burning sensation, which has obtained for it the common name of St. Anthony's fire.

Simple Form. The simpler forms of erysipelas are confined to the more superficial tissues, the *rete vasculosum* being the part that is chiefly affected. The difficulty generally commences quite suddenly, with a smarting, stinging pain and one or several bright arterial spots, which disappear for a moment upon pressure. From this it spreads rapidly over a greater or less extent of surface, sometimes occupying a single portion of the body, as the head, face, scrotum, or an extremity; at other times engaging the larger portion of the entire surface. The vivid scarlet hue characterizes it in nearly all situations, though there are many circumstances (as will be mentioned hereafter) which modify the color and give it various degrees of yellowness, transparency or lividity. It is peculiar of this form of erysipelas that pressure disperses the blood and leaves the part pale for a moment; and, after the continuance of the difficulty for several days, there may be what might not be improperly termed *pitting* of the color before the indentation of the fingers. The pain continues of the stinging, smarting, burning character and is very annoying and wearing upon the nervous system. In one, two or more days after the accession of an erysipelas, an effusion of serum will take place, giving the part a slight tension, soon filling up the inter-cutaneous spaces and causing swelling and a feeling of sponginess. When the difficulty lies wholly in the cutaneous structures, these advances are quite gradual; when the structures underneath become involved, the progress is much more rapid and the effusion, swelling and pain, are also greater. Sooner or later (generally in from three to six days from the onset) the serous effusions form several thin, spreading vesicles just underneath the epidermis. These vesicles either burst spontaneously, or may be easily ruptured, and discharge a watery fluid which is sometimes quite transparent, at other times of a slight yellow or orange tinge. Much relief is felt from this emptying of the vesicles (provided that the matter cast out is speedily removed) and it is common to have the inflammatory effort subside thereafter—as if the vital action had ejected the enemy and was now content to rest. This is more especially the case when the vesicles are few and small and have been tardy in appearing. When they are large and numerous, have formed rapidly, extend deeper than the rete mucosum and are accompanied by an areola of a purple tinge, the difficulty inclines to the phlegmonous type and is likely to prove much more baffling and serious.

The *phlegmonous* form of erysipelas involves the cutaneous and all the loose sub-cutaneous tissues. The arterial action often commences more suddenly than in the simple form and the advances are still more rapid. Serum is effused in very large quantities, causing great swelling, which sometimes becomes literally enormous. The skin is tense and shining; the color is usually a livid red, indicating a strong tendency to capillary stagnation; at other times the color is almost brown or black, foreboding extensive destruction of tissue. Sometimes very large vesicles are formed at or near the surface, discharging considerable quantities of yellow-tinged and foul fluid. At other times suppuration will take place in the deeper structures, form diffused abscesses and ultimately discharge thin, excoriating pus of a most unhealthy character. These abscesses are sometimes very large, forming in from five to eight days and spreading extensively through the structures, to the great endangerment of the patient's life. In more degenerate cases, masses of flesh will be separated in one great slough—dying and being cast off with alarming rapidity. The denuded surface will be soft and spongy to the touch and quantities of most unhealthy ichor will ooze out at every point. Destruction sometimes advances in this way till the very bones are reached; the muscles, veins and arteries, may remain in their position for a time, but soon give way before the chemical power. Amputation is the only hope the patient then has, and even this is to be considered a forlorn one. Fortunately, however, such instances are very rare and are scarcely met with except in foul hospitals or among the most neglected patients of a private practice. The phlegmonous form of erysipelas, however, is always to be looked upon as an extremely serious difficulty, being likely to exhaust the system to such a degree that it can not recover its healthy tone, even if limbs and organs are not reduced to the necessity of amputation.

GENERAL CONSIDERATIONS.—These two forms may be taken as standard and typical of erysipelas. Between them there are numerous gradations—the simple inclining toward the phlegmonous till it loses itself in the latter, and *vice versa.* Writers have made several other distinct types of this form of disease, but they are rather to be considered as mere peculiarities of circumstance and influence. The more common of these types is that known as the *bilious,* in which there are marked evidences of hepatic derangement, both before and during the inflammatory effort at the surface. This is more apt to be found associated with the simple than the phlegmonous form, and gives rise to the headache, nausea, vomiting, yellow tinged eyes and face, foul tongue, loss of appetite, scanty urine and constipation, common to biliary obstruction. The *edematous* type is of a more chronic nature and occurs mainly in persons of a very feeble constitution. The inflammatory action is inconsiderable; the effusion of serum is large but gradual, and gives a dropsical appearance and feeling to the affected part; the deep seated structures are involved; the skin is but slightly altered from its natural color; the pain is but slight; and the whole condition may be more properly termed a dropsy, with low inflammatory effort, than erysipelas of an edematous type. *Periodicity* is, occasionally, peculiar to erysipelas, persons of a gross and scrofulous habit being liable to have annual, or semi-annual, recurrences of the difficulty. Spring and fall are the seasons most favorable to its reappearance. It may occupy the same portion of the body before affected—as the face, extremities or trunk; or it may seek a new situation every time, shifting from point to point as often as it returns. Its reappearance seldom amounts to any thing more than a redness and an unpleasant smarting—vesication or suppuration scarcely ever occurring. These periodical attacks are mostly of the phlegmonous type and disappear spontaneously.

There is, as a general rule, marked constitutional disorder in all acute, and in nearly all chronic (or periodic), cases of erysipelas. Derangement of the digestive apparatus is first and especially observed and may be found present many days before the appearance of inflammatory action at the surface. A dry and coated tongue, foul taste in the mouth, impairment of appetite, head-ache, tenderness of the epigastrium and similar familiar evidences of gastric disturbance, are almost invariably present in a noticeable degree. Symptoms of cerebral excitement are not uncommon, even when the difficulty appears confined to some remote portion of the body, as the extremities. Dark and highly offensive stools are sometimes met with; at other times a decided diarrhea is present; but, when the evidences of hepatic derangement are peculiarly prominent, costiveness may be obstinate for several days and then be followed by profuse biliary discharges of a very foul character. The arterial sympathy is at first ardent and a large, bounding pulse, with proportional thirst and general elevation of temperature, may be expected in both the simple and phlegmonous forms. When vesication and suppuration take place, the heart and arteries will give warning of their depression by the threadiness and feebleness of the pulse, and extreme irritability and low delirium or stupor will be often found to mark the complete exhaustion consequent upon extensive decay. The patient is almost prostrated into a typhoid condition, and the vital effort at resistance will be of that insufficient character known as irritative fever.

All parts of the surface are liable to erysipelatous outbreaks; but the face and the lower extremities seem to be peculiarly subject to such attacks. The scalp is also a frequent point of its appearance, though it more commonly extends from the face to this part. The trunk, the upper extremities and the scrotum, are frequently affected with the difficulty, and, rarely, nearly the whole surface will suffer at one and the same time. The danger is greatest when the head and face are affected, and the constitutional sympathy runs highest when the difficulty is seated at these points or upon the lower extremities. In the soft structures of the conjunctivæ and scrotum, the redness is not as vivid as over other parts of the surface, and the inclination to edematous swelling is there very great, even while adjacent portions are laboring under the most marked phlegmonous, or the more simple, type of the affection. The advance of the inflammation is almost always toward the head and, even when the erysipelas appears upon the middle of any of the extremities, its progress downward is much less rapid than its advancement upward, or on the cardiac side of the circulation. This holds true even when the face is the point of attack, the head being much more likely to be next involved and the advance down the neck being quite uncommon and usually slow when it does occur.

An erysipelatous form of inflammation is by no means confined to the skin, but may attack any of the internal surfaces, as the mucous membranes of the lungs and alimentary canal, and also the uterine surface and the peritoneum in what is termed "puerperal fever." The stomach and bowels are generally found connected, either by sympathy or community of origin, with all cases of external erysipelas, and the practitioner must always be on the alert to anticipate too extreme a degree of gastro-intestinal irritation; for the concentration of the difficulty upon the inner surfaces is much more to be feared than its maintenance outwardly. Erysipelas is occasionally liable to *translation* from one part to another, shifting from the skin to the bowels or lungs, or from point to point upon the skin itself. It may do this spontaneously, gradually disappearing at the place of its onset, while reappearing with original intensity at some remote part. Or it may be removed at its original site by topical applications, when suddenly, as the practitioner is congratulating himself upon his success, it bursts forth at a new point and with increased virulence. Sometimes it is thus translated to the uterus, and the pericardium itself seems to have been the recipient of the erratic affection. It has, in many persons, a peculiar proneness to the head, even to the cerebral structures, and the scrotum is a common point of translation in those who have been afflicted with venereal forms of disease.

Erysipelas has been frequently observed to prevail *epidemically*, especially in hospitals, but also in private practice. When it occurs thus, it is generally of the phlegmonous form and proves most unusually fatal. It is met with, as an epidemic, much more frequently in the winter, or late in the fall, than any other season of the year. It is also, by some, considered to be contagious, while others wholly deny this. Observation, however, most conclusively proves that the phlegmonous type, after the formation of the vesicles or diffuse abscesses, is readily transmissible from one person to another. Indeed, such a result should be expected; for the discharge is so peculiarly corrosive and poisonous and so loads the air of ordinary apartments with its foul effluvia, that it would be a matter of surprise if the attendants could all prove able to resist its depressing influence. Very fortunately, however, it is seldom transmitted in its primitive virulence, and only those of a very gross habit are liable to infection, while it may be safely questioned whether the simple form of the affection is contagious under any ordinary circumstances.

NATURE AND CAUSES.—The heat, the pain and the swelling of the affected parts, show an increased determination of blood to them, and the scarlet hue of simple erysipelas is a proof that stagnation has not taken place. We have here, then, an inflammation which (like arterial excitement under other circumstances) is a vital act, tending to the reparation of some injury, the removal of some detrimental influence and the preservation of the integrity of the parts. But the tendency to spread, the stinging character of the pain, the almost entire absence of plastic effusion, the rapidity of destruction and the inclination to metastasis, show that the circumstances and influences which provoked this vital effort are different from those which ordinarily make occasion for inflammation. This may, by a little license in words, be termed an abortive action; for, though the effort often succeeds in expelling the noxious substances and then subsides because there is no more work for it to do, its incapacity to build up a resisting dyke is so out of the usual course of an inflammation as to almost seem a proof of vital insufficiency. An insufficiency it too frequently is—every tissue seeming to be prostrated and incapable of vigorous exertion and the blood itself being evidently so degenerated that the materials for a fibrinous dyke can not be found in it. Every observation proves that the fluids are poisoned and do themselves incline rapidly to destruction, and though the contamination is rarely of a character calculated to wholly decompose the nutritive fluid, yet it deteriorates the blood to such an alarming extent as to render an erysipelas a dangerous affection.

That the blood itself is the great seat of the difficulty, may be seen from several prominent facts connected with the course of this form of disease: 1st. In all cases where this fluid is not thus impaired, an inflammatory action builds up a fibrinous dyke of greater or less consistency; but in erysipelas there is hardly a trace of plastic infiltration, except in those simple forms which are most nearly allied to inflammation provoked by mechanical injuries, and even then the lymph is found to be unorganizable or, to say the least, unorganized. 2d. The spread of the inflammation is an evidence of the advance of the provoking and injurious influences of the poison, and we can not conceive of any mode by which this can proceed so rapidly as through the medium of the blood vessels. 3d. The progress is almost invariably along the surface, as if through the medium of the capillaries and the ultimate venous distributions. 4th. The change of the inflammation from place to place shows a similar translation of the poisonous material, giving a strong ground of assumption as to its existence in the body of the circulation.

That the tissues themselves are much affected can not be for a moment doubted, their complete reliance upon the circulating fluid rendering it impossible for them to retain their integrity when that fluid is impaired and deteriorated.

Those destructive influences are mainly of an animal character and may be either of internal or foreign origin. Perhaps the more tangible witnesses of the virulent nature of the origin of erysipelas may be seen in the foreign introduction of poisons, as from the bites of serpents, angry cats and dogs, from dissection wounds, from the lodgment of copper balls, the absorbtion of wauroli and many similar instances, familiar to all practitioners. These being all more or less noxious and liable to enter the general circulation, it is peculiarly illustrative of our argument to know that the inflammatory (vital) resistance stirred up by their presence is attended by all the peculiarities of an erysipelas, which varies in the degree of degeneracy according to the depressing potency of the particular poison introduced. The air is undoubtedly a fruitful source of difficulty in this respect, as may be seen in the sudden outbursts of epidemic erysipelas when there is only some unknown peculiarity of atmospheric influence to account for the devastation. Persons of gross habits, too, are much more liable to this singular form of inflammation than those of a more pure circulation; and those who have occupied unhealthy situations, used improper food and become enfeebled by the general improprieties of their mode of living, are in danger of an erysipelas upon the most trifling provocation. It is observable, too, that the difficulty is of the most intractable character in these persons; and it is a current fact that, the more gross the condition of the individual (other things being equal), the more unmanageable will be the erysipelas, *because*, in these cases, the greater is the load that the vital effort will have to remove and the sooner will the tissues sink under the depressing burden.

As the simple form of erysipelas is by no means as serious as the phlegmonous, so are some of the offending poisons more dangerous than others. For instance, if the difficulties come chiefly from the body itself, we know that a partial retention of perspiration is less injurious than a non-elimination of bile, that the retention of bile is not as bad as the failure to secrete urine and that all these retentions together will place the blood and the whole fabric in a much worse condition than when either one alone has been retained. So, the sting of a wasp is not as injurious as the bite of a rabid dog, and the virus of hydrophobia is not so suddenly fatal as the poison of the rattlesnake. We can readily understand, therefore, why some cases of erysipelas are so much more intractable than others; and a remembrance of these principles will furnish us with an unfailing key to the diversity of appearances, feelings and symptoms, which the practitioner will meet in different cases.

In the great majority of instances, the offending virus is of internal origin. It may, however, float the round of the system for years without accumulating at any one point to a degree sufficient to endanger the parts and make a necessity for an inflammation. The tissues, possessing just enough vitality to resist the deteriorating influence, may preserve their integrity for a length of time—plainly manifesting the presence of the noxious materials and the tendency to an erysipelatous outbreak, yet not yielding till some accident or circumstance causes a general or local feebleness, when the pent up poison will show its venom. Thus, it is familiar to see an erysipelas appear after peculiar exposure to cold, over-working in warm weather, a meal of some peculiarly gross food, &c. All such circumstances excite to a manifestation of the presence of the impurities of the system by so lowering the capacity of the structures as to allow the morbidities to obtain the mastery over the tissues. They are, therefore, to be considered as the *provoking* causes of the destruction of the tissues.

In those cases of erysipelas which come under the notice of the surgeon, these provoking causes are of various kinds, being usually some form of violence or solution of continuity in the soft structures. Thus, blows, falls, fractures, dislocations, sprains and similar accidents, excite an erysipelas in those predisposed to it. All manner of wounds, too, from the slightest and simplest to the most extensive and serious, may prove occasions for an erysipelatous development under the same circumstances. All operations, also, from the most simple incision up to the most considerable amputation—to lithotomy, taxis or the excision of a large tumor—may become provokatives to an erysipelas in patients in whom deficient vital action had allowed excrementitious materials to accumulate previously. The surgeon must ever be on his guard, therefore, to avoid performing any heavy operation while his patient's system is in an unwholesome condition; for he may fail in finding sufficient vitality to form a good plastic effusion, when either a most sweeping development of erysipelatous destruction will thwart his ends or an intractable form of ulceration ravage the incised parts. The danger, in such cases, will usually be observable within two or three days: for, if the vital force is capable of commencing the granulating process, it will do so within that time and then the parts will be safe; but if the present injury, added to the previous depression, render the healing efforts abortive, then an erysipelas is greatly to be apprehended. Under such circumstances, the erysipelas is apt to be of the phlegmonous form and the devastations are commonly very extensive, advancing toward the vital centers by rapid strides.

TREATMENT.—In treating a case of erysipelas, two objects must be kept continually in view, namely, to relax and stimulate. Relaxation is needed first and principally, that every tissue of the body may be softened, every outlet opened and the freest possible channel thereby made for the exit of any and every deleterious matter that may be found in the system. Stimulation, of a light and diffusible quality, is needed to sustain the arterial flow and aid the life power in its efforts to rid the frame of the noxious materials. These being the great indications—to support the system and drive out every form of virus—the relaxants and stimulants chosen must be those which are best calculated to perform such labors by their tendencies to the whole series of secernent organs and especially by their influence upon the skin and capillary system.

A proper reflection upon the true nature and origin of an erysipelatous difficulty will at once lead the practitioner to the conviction, that *constitutional* or *general* means are to be chiefly relied upon. A difficulty which depends so very largely upon unwholesome materials floating through the circulation, can only be removed by an elimination of those matters from that circulation; for which purpose every secreting organ must be employed to the best advantage and use made of every channel through which it is possible to push an atom of virus. Topical means are on no account to be neglected, for the immediate soothing and preservation of the parts are points of moment; but to depend upon local appliances in preference to systemic medication, is to run the hazard of prolonging the attack and favoring its spread, even if it should not jeopardize the patient's life.

The course of constitutional treatment usually begins with the stomach, that much abused organ which the habits of society force into so many dilemmas and which broods so much mischief to the whole system. Dr. Howard quotes Abernethy, as saying: "I 'll be hanged if erysipelas is not always the result of a disordered state of the digestive organs; but how to put it to rights I do not know." The foulness of the tongue, the headache and the loss of appetite, are quite sufficient to prove the justness of that eccentric doctor's remark; and, as these evidences are almost *invariably* present, in a greater or less degree, the earliest attention is likely to be needed at this center of nutrition. Of course it is the case here, as elsewhere, that, when there are no positive evidences of disordered digestion, medication need not be directed to that apparatus. The Physio-Medicalist, however, is not in the dilemma of honest Dr. Abernethy—he knows "how to put it to rights" by the free use of lobelia emetics. An infusion of ginger and geranium, with a fair proportion of asclepias, makes an excellent preparatory drink, though any similar mild agents may be used. Let the teas be drank freely and the lobelia given in two or three separate doses, that the influence may be searching and a complete revulsion wrought in the system by the operation. The benefits derived from such an emetic are of the most desirable kind. It is not uncommon to see a threatening attack of erysipelas completely averted and the tension, burning and danger of a livid plegmon relieved by a single act of emesis induced by the above means. At times, it is necessary to repeat the emetics every third or second day, and, in some cases, two or three will be required in daily succession, though one thorough course is commonly sufficient. On this point, the practitioner must judge according to the indications of the case before him, remembering that it is an impossibility to obtain any satisfactory relief as long as there is the least evidence of gastric impurity.

The prima via, as a whole, is very likely to require early and careful attention. Though there may not be actual costiveness in all cases, there is usually a great irritability of the alvine canal from the passage of foul and acrid feces. Large mucilaginous enemas, at a blood temperature, should be given freely; and it is a good plan to administer two such clysters night and morning for the first few days, or till the bowels are evidently rid of their injurious contents. If there should be an inclination to dryness of the feces, a small proportion of lobelia added to the mucilages will secure more moistness to the mucous surfaces, besides relieving the general tension of the system. If the costiveness is decided, a mild stimulant, as ginger, may be incorporated with elm and lobelia in clyster and small quantities of leptandra, juglans or apocynum, used (per orem) to relieve the inactivity of the biliary apparatus when it is clogged. The establishment of a diarrhea is to be considered as an evidence of nature's exertions to rid the inner system of foul materials, and the only medical interference usually needed will be bland and lubricating drinks, as of elm or gum arabic water impregnated with spearmint, balm, &c. Enemas of elm or mallows will relieve tension and pain in the lower bowels. Astringents need not be employed in any but the most severe cases, and then only after the lubricating drinks and clysters have aided in the entire removal of all morbific accumulations in the canal. It is seldom that any but the very mildest agents of this class are needed, as hamamelis and rubus.

The diffusively relaxing and stimulating drinks are to be used freely, that the skin may be kept in a state of gentle moisture, continuous and profuse perspiration not being required. A very weak infusion of ginger and spearmint, or ginger and asarum, will usually be found grateful to the patient. Sage, balm and catnip, may also be used in mild cases. Hedeoma, aristolochia, leonurus and similar stimulating and tonic agents, may be employed when there is a tendency either to a typhoid condition of the body or gangrene of the erysipelatous surface; under which circumstances a freer perspiration should be maintained by the liberal use of such articles, emetics of a more stimulating character being given and the mouth (if troubled with sores) gargled frequently with number six, capsicum or bayberry. Small quantities of the third preparation of lobelia may be added to any of the above infusions when the patient feels faint or is inclined to sigh; the compound spirits of lavender may be used in the same way. When the kidneys are too inactive, galium or seeds of arctium lappa may be compounded with ginger, asarum or any other article that may be selected. If there is much feebleness of the nervous system, cypripedium or scutellaria with ginger will be applicable. Selecting the articles in this way, according to the several wants of the system, their use must be steadily continued till the difficulty is relieved. It is always best to make the infusions quite moderate in strength and give them freely, as this secures both a more diffusive and prompt action of the medicines and an abundant supply of fluids to the circulation.

The vapor bath is one of the most important means that can be employed in this difficulty, so completely loosening the surface as to give the best chance of escape to the viri which are there accumulating. It also gives the most desirable relief to the burning, stinging pain and quiets the nervous system, to the great advantage and comfort of the patient. These baths should be given every day in acute cases, the patient sitting up or lying down, as may be deemed advisable, and a moderate temperature only being used. The daily tepid wet-sheet pack may be administered in lieu of the vapor bath, effecting the same general results, though more slowly. The pack is preferable in very feeble cases, and also has the advantage of being easily medicated whenever a medicated bath may be considered desirable. We have frequently used lobelia, sage and catnip waters with this pack, and always with the most happy results, giving freely of some of the above diaphoretic drinks all the time. An excellent plan is to wash the whole surface freely with a weak ley water, or a suds of castile soap, while giving a vapor, and before giving a pack, bath, though the alkaline wash need not be repeated every time—perhaps not more than a single time—which will be determined by the presence or absence of a greasy feeling upon the surface. In the use of alkalies, applicable as they are to this class of cases, we advise our practitioners to not be too lavish or allow their enthusiasm to carry them into such an extreme as that attained by an elderly practitioner of Auburn, N. Y., who wrapped up an erysipelatous patient in a sheet of soft soap, to the complete destruction of the epidermis.

The *local* means that may be used are very various in their character and are to be selected according to the requirements of individual cases. As a general rule, liquid appliances are preferable to any other, being better calculated to admit the escape of heat and hence offering the greatest ease while they convey almost any form of medication that may be desired. The use of poultices, however, is by no means to be rejected.

In the simple cases of erysipelas, where a scarlet hue and intense heat evince a very active local circulation, the plain cool-water dressing is among the most grateful and beneficial applications that can be made. A soft linen cloth may be laid next to the surface and a single layer of flannel or other woollen fabric wrapped over it. This may then be moistened with cool water, the water being renewed as often as the cloths become filled with heat. If the inflammatory effort is very ardent, the part may be irrigated with water of a moderately cool temperature, a piece of oiled cloth being so spread upon the couch as to convey the water away as it accumulates. A weak infusion of lobelia or sage may be used instead of simple water, especially where the tension of the parts is considerable. But the rule, consult the feelings of the patient, must be observed here, as elsewhere, in the application of water; and if a low temperature gives any feeling of chilliness, a higher one must be employed and the renewals be less frequent. As the *simple* erysipelas declines into the *phlegmonous* form and the inclination to stasis becomes greater, the fluids must be applied at a blood heat, and the water may be medicated with baptisia, cimicifuga and the juice of leeks or cranberries. In dark phlegmons, when a mottled appearance shows a decided tendency to sloughing or gangrene, infusions of polygonum, sabbatia, arum, xanthoxylum, myrrh or capsicum, may be applied, accordingly as a mild or more positive stimulant seems to be demanded. Brown spots on a livid surface can not be too promptly treated with capsicum, xanthoxylum and myrrh, dilute hot-drops and similar powerful means; a simple lividity with quagginess from serous effusion can be managed with infusions of polygonum, zinziber and aristolochia. The recommendation of such stimulating agents in cases of "inflammation" will, of course, seem strange to the uninitiated, but a reference to former chapters will make known the philosophy upon which this practice rests. Let it be plainly understood here, that local stimulation is only advised when the extent of congestion and the degree of degeneration make the occurrence of sloughing a matter of the strongest probability. The stimulants should be put on before the destruction of sub-cutaneous tissue has made a diffuse abscess. It needs but a proper experience with these means, under these circumstances, to demonstrate their saving efficacy.

When solid applications are preferred, the following may be the mode of local management: Very fine, dry powder of ulmus fulva may be sprinkled over the part, or rye flour may be used for the same purpose. Both these allay the intense itching and also absorb the excoriating materials which will be driven out upon the surface by a proper course of internal medication. Or, a very light poultice of elm and lobelia may be used, the proportion of lobelia being as two to one in ardent inflammatory action and equal with the elm in cases of a more phlegmonous cast. Wheat or oat bran may be used in the same way; or malva, linum or other demulcents, may be employed as a basis and any suitable medicament added. The comptonia (sweet fern) is greatly valued by many practitioners in cases where there is no gangrenous tendency. The juice of house-leeks or stewed cranberries, mixed with a demulcent, is also recommended, though our own experience with them does not yet allow us to place much dependence upon either. If there is an inclination to sloughing, baptisia, polygonum, asarum or zinziber, may be incorporated with the demulcents, and a decided tendency to gangrene calls for the immediate and liberal use of xanthoxylum, capsicum, arum or myrrh, as above advised. Poultices should always be made light and renewed about every six or eight hours, being occasionally moistened, in the meantime, so as to prevent their drying to the surface. It is well to wash the part with very weak ley water and then smear it with olive oil and lime water previous to the application of each poultice. A small proportion of lobelia may be added to any one of these poultices with very great advantage, it being important to maintain a local as well as general relaxation.

When vesicles are formed, it is proper to open them at the most pendent portion, using a fine needle for the purpose, that the unwholesome fluid may be allowed to escape without the unnecessary rupture of the cuticle and the admission of the air. Abscesses, whether diffuse or circumscribed, are to be treated in the same way as abscesses under other circumstances, care being always taken to make the least possible abrasion of surface. It is customary with some to make numerous and extensive incisions in an erysipelatous surface, and that only in anticipation of a diffuse abscess. Such a course can not be too strenuously avoided, and no amount of temporary popularity it may enjoy with the profession should be allowed to draw the prudent surgeon into so rash a procedure. It is wholly unphilosophical and cannot but lead to a much greater destruction of tissue than need otherwise take place; for, if simple incisions will become provocatives of erysipelas in one inclined to it but free from it, what evil may not be expected from similar injuries to the integuments when the poisonous accumulations are already taking place? It is time enough to incise when deep suppuration has actually commenced; and, as the above directed course of constitutional treatment is potent in thwarting every grade of destruction, the probable smallness of the abscess is likely to need none but small openings. Circumscribed abscesses are to be discharged with much care, and there is a strong tendency to gangrene about them which must be combated with the most prompt means and by every anticipating precaution.

It is no uncommon thing to have abscess sacs and vesicle bottoms resolve themselves into most obstinate ulcers, the aplasticity of the effusions causing their decay and keeping up a constant, ichorous discharge with scarcely an attempt at granulation. Such ulcers demand the utmost care and watchfulness from the practitioner. They are to be treated according to their general character and by the means which have been already advised in the chapter upon *Ulceration.*

After the discharge of the virulent fluids, the patient usually experiences great relief, the ardent vital resistence subsiding and the system becoming comparatively quiet. The body must now be well sustained by the more permanent and stimulating tonics and an invigorating system of hygiene, lest the reaction following the previous intense exertion should allow the frame to sink too low. Such bitters as hydrastis, populus, aletris, leonurus and gentiana, are to be administered, and some of the aromatic stimulants may be added, as cloves and ginger. The kidneys are to be kept in free action by eupatorium purpureum, ambrosia or juniper. The hepatic function should be kept free by small quantities of juglans or leptandra, with the addition of small proportions of capsicum. Infusions of ginger and aristolochia may be required, especially when the pulse is quick and small. The diet should be nourishing but digestible, and all prudent ventilation and cheerfulness should be secured.

CHAPTER VI.

SCROFULA.

Scrofula in General.

THE term scrofula is so wide in its signification and has been made to embrace such a diversity of conditions, that it is almost impossible to give it a definition that has any likelihood of being receivable. Almost every individual writer has attached to it a meaning of his own; and this form of disease has been made to embrace so many differing, and almost opposite, conditions, that nearly every chronic surgical affection not distinctly an abscess, an ulcer or a calculus, might almost be traced bodily to scrofula. Much confusion has thereby been created, yet there is broad ground for attaching such a general meaning to this term; for it is palpably a constitutional disorder, affecting alike the solids and the fluids, engaging every portion of the human fabric in its grasp, appearing in any or all of the structures and manifesting itself in an endless diversity of ways, in the most various degrees and under the most different circumstances. There has been much said about it, however, which is purely fanciful, the whole subject having been one of the most fruitful sources of speculation and hypothesis. It may well be imagined, therefore, that we address ourselves to the task of the discussion of this subject with much hesitancy, feeling, indeed, that it will be an almost interminable labor to unwind it to the satisfaction of any portion of the profession. Did it not lie so directly in the path of surgery, making a necessity for numerous operations and interfering with many others, we confess that we would summarily dismiss it to the care of thors upon Practical Medicine.

Reversing the usual order of proceeding, let us first inquire into the conditions to which all men, by common consent, attach the term scrofula, and then examine the nature, origin and extent of those conditions.

The developments of scrofula consist mainly of peculiar tumors situated in various parts of the body, but particularly in the lymphatic glands of the neck, axillæ and groins; also in the bones and, more rarely, at irregular points upon the cuticular surface. These tumors may be very small, varying from the size of a pea to that of an egg. When small, it is usual to find a number of them existing at one and the same time, either associated or appearing on various parts of the body; when of considerable size, the number is more likely to be limited. These tumors appear to rise spontaneously and are hard, firm and rather deficient in sensation. They enlarge with various degrees of rapidity, but always at a very moderate pace—months being sometimes required for the development of those of ordinary size and years being occasionally occupied by the growth of a crop of small ones. Their enlargement is not the result of effusion consequent upon an inflammatory effort; for it is a peculiar fact that elevation of vital action is a rare accompaniment and, when it does occur, it is much more likely to arise after the tumors have reached a considerable size than before their appearance. The tumors may remain at a fixed point for many years, neither enlarging, diminishing, causing pain, becoming objects for vital resistance, nor destroying the tissues in or around them. At other times, and these are most frequent, the structures break away, a trifling inflammation is established and there is decay of tissue mixed with the effusion of vital action, the two forming a peculiar scrofulous pus. When the growth of the tumor has been rapid and the decay speedy, the purulent discharge is of a corrosive character, excoriating any surfaces over which it may flow, yet rarely being virulent enough to cause actual abrasion of sound parts. It may be thin and ichorous; often curdy, thick and scanty; but again viscid, homogeneous and of an ugly green, or yellowish green, tinge. In those tumors which have been tardy in development and slow in causing destruction of tissue, the discharge is apt to be much more bland, though still liable to a very great diversity of character and quality.

When an incision is made into one of these tumors and a microscopic examination instituted, it will be found to consist, 1st, of the normal substance of the part affected; 2d, of granular bodies dispersed, more or less compactly, through the parenchyma, forcing the tissues asunder that room may be made for their accommodation. These granular bodies constitute the difficulty, the immediate, tangible essence of the malady and, as such, engage our earnest attention.

The granules differ very materially in size, varying from that of a pin head up to a large hemp seed and occasionally even to a pea. When associated, it is quite easy to distinguish them with the naked eye. They are also very various in other respects, at times ovoid, again globose, then oblong and flattened; smooth, jagged, indented; gray, grayish yellow; opaque, transparent, semi-transparent, shining; hard, soft, oily, curdy. And many of these differences may be found in a single case—large granules being mixed with small ones, hard with cretaceous, ovoid with flattened, and so on, in every imaginable diversity of ways. A still more minute examination shows these bodies to consist of an enveloping membrane containing one or more small molecules with nuclei, the molecules and nuclei giving the main features to individual granules. Their origin is evidently from the blood, being thrown out slowly, imperceptibly and continuously, among the interspaces of the tissues. Their seat may be "at any point of any texture extraneous to the blood vessels. Wherever there is a capillary range, a deposition * is possible" (Rokitansky, vol. i, p. 231).

A chemico-vital analysis of these granules shows them to be composed of nearly equal parts of albumen, gelatin and fibrin, the fibrin rather predominating. The coat or envelop is found to be a blastema, quite rapidly coagulable and approximating an organized structure. The contents of this envelop are considerably removed from any thing in the shape of coagulability, being most decidedly unorganizable in their character. The granules differ very much, however, in different cases, being at times so analogous to tissue as to have slight permeations of capillary vessels visible upon their coat, while at other times no traces of the most rudimentary circulation can be found.

After a time, varying according to the approach to, or recession from, an organizable capacity, these granules begin to decay. The destruction is in the form of softening, most commonly commencing at the center and thence gradually proceeding to the circumference. They slowly enlarge as if from an increase of moistness, become more soft and pulpy and finally lose all their characteristics as granules, appearing like a homogeneous mass of a more yellow tinge than before.

This softening commences with those which were exuded first and are consequently the oldest. In large tumors, a great number of granules begin to decay about the same time, those in juxtaposition to these next begin to moisten, and so the process advances till the whole mass passes into a semiputrid state. As the blastema and its contents decompose, they injure the living tissues among which they are distributed, causing their gradual destruction. The rotted granules themselves, however, first pass away, leaving the intermingling fibers in their position, where they present a network appearance, with the feeling of an excavation underneath. A good illustration of this is in the case of scrofulous ulcer already mentioned.

We have here all the best substantiated facts in regard to the contents of scrofulous tumors, which contents are commonly known by the name of tubercle. It is evident, from a careful examination, that these materials are very analogous to the plastic or lymph material of the blood. They have the same composition, show many of the characteristics of coagulable lymph and seem to want only vitalization to make them organizable. And yet they are not wholly devoid of life, as is at once seen in the fact that they do not mortify, but suppurate gradually—not forming a slough, but a purulent discharge. In the long standing tumors, which only decay after years, or perhaps remain *in situ* during a person's whole life, the tubercular exudations appear to be but one remove from good plastic material—the life power retaining a sufficient hold upon them to keep them from falling under the chemical laws, yet not being capable of molding them into a usable structure. In those tumors which rise more suddenly, decay more rapidly and give origin to an ichorous discharge, the tubercle is of a much more degenerate character, yielding more readily to the chemical than the vital power. The invariable tendency of tubercle to decay and to involve the adjacent tissues in its destruction, causes it to be classed among the noxious exudates, and scrofulous tumors to be ranked among the malignant growths; yet the close resemblance of tubercle to nourishing lymph and the tardiness of its advances toward decomposition, show it to be the mildest and least baneful of the malignant depositions. But it has already been seen that there are great variations in the degrees of tubercular virulence, it being scarcely injurious in some cases, while it is extremely baneful in others. And the facts of its extension through the whole system, existing in a mixed state in the circulation and weighing upon every tissue and reducing the active plasticity of the nutritive fluid, render it, at times, a peculiarly formidable opponent to successful surgery by hindering the proper reparation of sores, wounds and operations.

It now becomes an interesting question: What is the origin of tubercle? In answer thereto, there would seem to be a sufficient number of facts to warrant us in placing it as a sequence of deficient elaboration of the nutritive materials—a failure of the assimilative organs to fully prepare and vitalize the albuminous portions of the food. Being merely a slightly degenerated fibrinous, or lymphy, compound, it must of course have the same origin as all lymph, namely, from vital transformation of the albumen as it passes through the assimilating organs. These materials can not reach the blood by any other channel; and it is evident that tubercle has undergone a goodly degree of vitalization—for it does not decay as readily as simple albumen would in similar positions and its own corrosiveness is exactly proportional with its approach to, or departure from, the nature of a protein compound. As this vitalization of albumen is always and invariably performed during the passage of aliment from the stomach to the left side of the heart, tubercle has ceased to be pure albumen only in consequence of the vital influence exerted upon the food by those parts, and has failed to become pure fibrin, good plastic material, only from the functional inability of the organs there concerned. The varying degrees of tubercular degeneracy are but so many witnesses of different degrees of that organic and functional inability and also of the various portions of the vegetative apparatus which have failed. For it must be remembered that the process of assimilation is carried on by the instrumentality of an intricate series of organs, and a failure of nutrition implies much more than simple gastric indigestion. The stomach, duodenum, lacteals, mesenteries, liver and lungs, are all directly concerned in the function; and inability of any one of these will compromise the integrity of the whole system by crippling the remainder of the human fabric in its fundamental part—nourishment. It is more than likely that the special point of assimilative failure has much to do with the degree of tubercular degeneracy. If the lungs alone are disabled from properly oxygenating the blood, the albuminous portions of the food are not so apt to be ill fitted for physical sustenance as if the disease lies in the lacteals or mesenteries; for, if the chyle has passed through these latter without any vital interruption, it has received all the benefits of those portions of assimilation, and the incapacity of the lungs leaves it but one step from nutritive perfection. If the lymphatic portion of the vegetative function fails, the rudiments of tissue plasma are blasted at the very outset, and are as much more noxious than in the former case as the lacteals are more distant from the point where assimilation is completed.

Recognizing, then, an inability at some point in the series of assimilative organs as being the source of tubercle and, therefore, the foundation of scrofulous forms of disease, it is next interesting to learn the influences which are most calculated to work such functional disability. For the sake of convenience, these may be classed under the following heads:

Improper Habits, as relate to food, air, light, clothing and exercise. 1st. Persons living, or forced to live, upon thin, unwholesome and innutritious diet, are found to be peculiarly liable to scrofula. The poor, whose circumstances too frequently compel them to impoverish their system by eating such cheap articles as their penury can only afford, suffer more than the rich; persons confined by law upon a low diet, soon exhibit evidences of struma; and restriction to a few articles of aliment, even of a good quality, will be found to impair assimilation and weaken the system by denying it some of the nutritive elements which are only to be had in an extensive variety of foods. All these causes are seen at work much more frequently in some European countries than in any portion of our own bountiful land. 2d. Impure air is a very prolific source of injury, directly impairing the lungs and denying the blood the amount of oxygen necessary for a full elaboration of nutritious materials at this point. Low, damp situations, inclement seasons and exposure to rains, are all found to be very detrimental to the assimilative functions, strongly inclining them to that debility which leads to the accumulation of tuberculous materials in the circulation. 3d. Deprivation of light evidently has a strong influence in disabling the nutritive apparatus. Persons living in darkened rooms, in too closely shaded houses, in cellars and in dungeons, are found to be peculiarly liable to tubercular developments. The influences of dampness and impure air are associated with the deficiency of light in the majority of instances. Yet numerous carefully conducted experiments, with rabbits, dogs and other animals, fully warrant the conclusion that this medium is of the greatest importance in maintaining vigorous assimilative action. 4th. The injurious influence of irregularities in clothing are not of so striking a character as the foregoing improprieties; but there can be no doubt that an insufficiency of covering weakens the whole digestive capacity; more, however, by the evils done thereby to the whole economy than by any direct bearing it may have upon these organs themselves. 5th. Want of exercise is a great bane and a fruitful promoter of scrofula, as may be familiarly seen in the great number of consumptives found among women, clerks and persons of like sedentary habits.

Wasting Forms of Disease.—Under this head might be included a great variety of maladies, but as no one of these seem to have a more special influence than the others, they may all be safely included in the general class of chronic or sub-acute affections which lead to general debility. In this connection may also be mentioned the continued use of alcoholic liquors and mercurials, the last of which is a most prolific source of tubercle—a fact that is admitted by every intelligent Allopathic observer and writer upon the subject.

Hereditary Influences.—Probably there is no other form of disease so liable to transmission from parent to child—the degeneracy of the assimilating organs, in father or mother, influencing the same portion of the fetal apparatus to such an extent that the child comes into the world with congenital inability to elaborate the food into good nourishment. A marked tendency to tubercular deposit is the result; and these children are strongly inclined to an early appearance of scrofulous tumors and ulcers. There is not a fatality, however, in this matter; for the children of most decidedly scrofulous parents may be born comparatively free from the taint and with good vegetative organs, especially when the mother has obeyed the laws of rational hygiene during her previous life and through the term of gestation. And those who are thus congenitally debilitated, may escape all unpleasant evidences of the diathesis by a rigid and persevering attention to their habits and careful avoidance of all practices which are calculated to impair the nutritive function. On the other hand, those who have not inherited such a constitutional disposition from their parents, do not enjoy an immunity from struma; for, by exposing themselves to the injurious influences mentioned in the first class, time will so impair the series of organs in question as to most positively lead to tuberculous exudations.

Tubercle may exist in the system in an undeveloped condition for many years—even for a whole lifetime; that is, the assimilative function may fail at some point and unfinished albumen escape into the circulation and keep going the rounds of the system without lodging in any organ or manifesting itself by any other evidences than those found in the general appearance of the person. The process of elaboration may be so nearly performed and the rudiments of tubercle so triflingly degenerated, that the tissues of all parts of the body may be able to resist any tendencies to their accumulation at particular points. Under such circumstances, scrofula can scarcely be said to have an existence; yet the inclination to its development may be unmistakably traced in the system at large. There are two varieties, or forms, in which such tendencies appear. The first and most common form is that in which the skin is thin and fair; the eyes of a light, half milky blue; the hair light and often quite flaxy in both young and old. The eye is generally large and active; the cheeks are ruddy and there is a peculiar pearly blue tint in the corners of the eyes, at the angles of the mouth and the wings of the nose; the pulse is quick, firm and bounding and there is a tendency to general intensity of action and feeling. In the other variety, the skin is brown and sallow, the eyes dull, the hair coarse and every feature heavy. Both varieties are usually found associated with much mental power—the former being quick and sprightly, the latter solid and enduring.

Persons thus inclined to struma are liable to suffer from exudation of tubercle upon trifling occasions; and even those in whom there is not that marked lymphy degeneracy which will lead to a spontaneous manifestation of the difficulty, are liable to such dispositions at any moment. A slight bruise, undue friction, continuous pressure and similar insignificant influences, may become provocatives to cutaneous or subcutaneous exudation in the form of tumors. An untimely indulgence in some forbidden article of diet or drink may lead to a similar train of symptoms in some portion of the alimentary canal. Exposures to dampness or unwholesome air may become excitants to tubercular depositions in the lungs; and in this way the accumulation of the unwholesome materials may be brought about in any tissue of the body by any, or the most inconsiderable, debilitating influences operating upon the part. These facts are sometimes of much importance in determining the expediency, the time and the point, of surgical operations; for the use of instruments may prove such a provocative to the exudation as to materially interfere with reparation of the incisions, or may even occasion a scrofulous development where no unpleasant evidences of a tubercular diathesis had before appeared. Fortunately, however, these results are only to be apprehended in those very degenerate cases where the failure of the vegetative function has been very marked and the circulation is loaded with unelaborated albumen ready to burst forth upon the slightest provocation. But these facts must always be borne in mind by the careful surgeon, who will not operate unless forced to it by the most immediate necessity, till the blood has been purified and the assimilating apparatus invigorated, as far as possible.

All portions of the body, as has been already remarked, are liable to these tubercular deposits—not a single known tissue being exempt. It needs only a failure in the nutritive function, the passage of degenerated lymph into the blood and then a slight local irritation, to develop struma in any of the structures. As some portions of the body are more exposed to irritation than others, we find more cases of tubercular development in those portions. The great majority of cases exist in the lungs, constituting pulmonary phthisis; next in the mesenteries, again in the kidneys, the liver, the cerebral ganglia, &c. All these cases come entirely under the province of the medical practitioner, as indeed may be said to be the case with every form of scrofula except as surgery has to deal with it in the extirpation of the parts destroyed, or being destroyed, in consequence of the exudations. The cases which will particularly come under the notice of the surgeon are: 1st. Those connected with the skin and lymphatic ganglia, forming tumors which may demand the use of the knife or leading to ulcerous destruction and requiring the aid of chirurgical art. 2d. Those connected with the osseous portions of the system, which may call for amputation on account of threatened involvement of a whole limb, or may form abscesses which will need opening or lead to actual caries or necrosis. 3d. Those which affect the cartilages and synovial membranes and make surgical cases by provoking ulcerous destruction of these tissues.

MANAGEMENT.—The management of scrofula, in whatever form it may present itself, consists: 1st. In the adoption of that course of hygienic regulations which is best calculated to invigorate the faulty portions of the organism and enable them to supplant the tubercular rudiments in the blood by furnishing a more healthy and nutritive fluid. 2d. In the ejection (by aid of medication) of the degenerated albumen floating through, and being deposited in, the various portions of the system.

A remembrance of the character of the influences which bring about that debility of the assimilating organs which leads to the tubercular diathesis, will be found a sufficient reason for making hygiene the first, last and principal part of the management of scrofula. It is but taking away the influences which lie at the foundation of the malady and substituting sanative and strengthening influences in their stead. The freshest air must be furnished and dry, open and elevated situations chosen whenever practicable. All exposure to improper dampness and inclement weather must be most sedulously avoided; and the clothing must be regulated with great care, that the body may not at any time become chilled for want of provision against sudden changes of temperature, or the heat too much abstracted by wearing wet apparel. All sedentary habits must be avoided as far as possible and a regular course of gentle out-door exercise or employment enforced, as the patient thereby obtains the triple benefit of fresh air, light and an improvement of digestion. A regular system of bathing should also be observed, the water being employed at that temperature which proves most agreeable, and thorough reaction should be induced by the application of good friction after the baths.

Much difference of opinion exists upon the question of diet. Heretofore, and with a large class at the present time, animal food of a decidedly oleaginous character has been preferred—pork, butter, cod-liver oil, each in turn, being lauded as peculiarly fattening for patients of this class. Our own opinion, however, is decidedly in favor of an almost purely vegetable regimen, which, we think, presents nutritious elements to the system in a form that is much more usable than when the same elements are given mainly in the form of animal flesh. That scrofulous patients usually become plump and ruddy upon the use of the oils, is a matter of common observation; and it is observable that this fullness is not permanent—the face soon becoming even more sallow than before and the roundness giving way to a pithy obesity which is any thing but indicative of good health. It is a well known physiological fact, also, that oils are more difficult of digestion and assimilation than the albumen, gluten and saccharum of vegetables, and it would seem but a poor philosophy to attempt the rectification of a form of disease, which is almost wholly due to failure in the nutritive apparatus, by feeding the patient upon that kind of aliment which is calculated to still further tax that very portion of the organism. The success, too, which has attended the use of a purely vegetable diet, both in single and extended observations, speaks largely in favor of its adoption, notwithstanding the morbid cravings for flesh so common to some strumous persons. Yet it may not be advisable to wholly interdict the use of animal food, though we have, for ourselves, seen enough of the efficacy of a vegetable diet to be decidedly prepossessed in favor of such a course.

In directing a patient to pursue this hygienic course, it must not be expected that marked benefit can be obtained in either a few days or a few weeks. Several months will usually be required to work the desired change; and, when the object is a preservation of the frame against the contingency of tubercular deposition, or perhaps an eradication of the tendency from the system, many years, indeed a whole lifetime, may be required for the purpose. Great perseverance, therefore, is absolutely necessary in all cases where relief is worth obtaining or immunity worth enjoying.

Medication is to be mainly constitutional, having for its object the softening and stimulation of the whole series of secernent organs, that the circulation may be freed from the improperly elaborated albumen floating in it and the system aided in reabsorbing and casting out that which has been deposited among the interspaces of the tissues. Local appliances to the deposits are not to be much depended upon, though they always form valuable auxiliaries to the other means and should not be forgotten.

The chief medical dependence is placed upon the class of agents known as alterants; these, usually, should be of the stimulating character. Smilax, stillingia, rumex, alnus, arctium, guaiacum, euonymus, juglans, chimaphila, aralia, leontodon, menispermum and many other articles which have a tendency to arouse general secernent activity, are employed, being usually formed into sirups. Those of the more stimulating character may be used by themselves, or the relaxing ones may be compounded with small proportions of capsicum or mezereon—the influence of these being carried to the eliminating organs by the alterants and there giving the desired degree of stimulation. There are many cases in which but a *very* small degree of excitation is required, and at no time is a sudden and powerful influence of this kind needed, those articles which are of a pure, but permanent, alterative quality being best adapted to these forms of disease. The practitioner may find, in individual cases, that particular secernent organs are strongly inclined to torpidity, when they will require the use of those agents which exert a direct influence upon them, as eupatorium purpureum and apocynum cannabinum for the kidneys, leptandra for the liver, aralia and lobelia for the lungs, &c. These agents must be used constantly and in considerable quantities; for the whole constitution is to be rebuilt, as it were, and time and strong influences are needed for the purpose.

The use of ablutions has already been referred to among the hygienic measures; but the vapor bath, or wet sheet pack, should be used frequently, being the most powerful aids to absorption and depuration that can be brought to bear upon the surface. We altogether prefer the vapor bath, using it at a moderate temperature and continuing it for a considerable length of time. It influences the absorbents to take up the strumous depositions preparatory to casting them out; and has been proved to be one of the best removers of tubercle that can be employed. It may be used every day, every second or third day or once a week, as may be deemed necessary.

Local appliances can be useful, when an actual sore does not exist, only in proportion as they influence the absorbents to act upon the exudations. It is very fashionable to recommend iodine, in some of its preparations, both internally and externally, for this purpose; but we do not hesitate to pronounce it perfectly useless in this connection, even if its character would admit it into the class of sanative medicaments. Abundance of observation has shown that its reputed efficiency exists wholly in the imagination and the benefits attributed to its use should be accredited where they belong, namely, to the virtues of the alteratives with which it is so generally combined. Asarum, laurus, mentha viridis and aralia racemosa, are the best local applications that can be employed with a view of favoring absorption of tubercular deposits. The addition of lobelia seeds always increases their value. Spirits of gum camphor may also be used.

CHAPTER VII.

CANCER—CARCINOMA.

General View of Cancer.

THE terms cancer and carcinoma are applied to a large and peculiar class of morbid growths, or enlargements, which affect all sexes and all ages, appear in every tissue of the body except the horny and are formed at the expense of the surrounding structures and the whole blood—tending finally to destruction by ulceration and causing death by exhaustion of the nourishing fluids and the prostration of incessant pain. The word cancer is said to have been derived from the generic name of the crab, on account of these tumors having numerous thready prolongations stretching from the common center among the adjacent parts. Cancerous tumors are classed as *malignant* growths.

These tumors, like those of scrofula, begin with small indurated lumps, generally seated in the glandular structures, enlarging rapidly and varying from the size of a pea to that of a man's head. They are usually accompanied by very great pain, which is of a lancinating and gnawing character—at times almost unbearably severe, again moderates to a pungent sting, but scarcely ever remits. The pain recurs in paroxysms, without any apparent cause; but in women who are menstruating, the catamenial periods generally bring an accession of the misery. During enlargement of the tumors, inflammatory resistance is seldom established, the cutaneous and sub-cutaneous tissues appearing and feeling perfectly natural; yet sometimes a moderate degree of excitation is observed, and this increases to a greater intensity as the difficulty advances.

Cancerous tumors differ materially in their appearance and the consistency they present to the touch. Sometimes they are rough and knotted, feeling like irregular and knobbed lobes; branch out in various directions, or have a somewhat spherical form; are flattened, or considerably elevated. Again, they may be quite smooth and even under the finger and appear like a uniformly infiltrated mass. In most instances, the borders gradually and imperceptibly lose themselves among the surrounding structures; but cases are not wanting in which the edges are pretty distinctly circumscribed, having a decided limit and terminating almost abruptly. In some cases the tumor feels very hard and rigid, being so dense as to almost seem like an earthy concretion imbedded in firm integument; in other cases a yielding and half elastic feeling is found; while again a decided pulpiness may be present from the very first. These variations generally depend upon internal characteristics that divide the general order of cancerous tumors into several genera, which will be hereafter more fully considered.

The enlargement of these tumors differs greatly in rapidity. When they occur in adult life and have a dense, firm structure, several years may make only a trifling difference in their bulk, and persons in advanced age may never suffer any unpleasant consequences, the tumors almost remaining stationary. In earlier life, or in the softer forms of cancer, the growth is more rapid, a few months being sometimes sufficient to cause a very surprising increase of the bulk, and daily examinations of some cases will almost reveal a perceivable degree of enlargement. The rate of growth seems to depend upon the amount and freedom of local circulation—those tumors in which the cancerous structure is least compact swelling most rapidly, and young persons being much more liable to speedy development than those who are older. These influencing circumstances are almost always coexistent, a hard carcinoma being rarely found in children or youths, although the softer (colloid and encephaloid) forms are met with in adults; but the harder (scirrhus) form is almost invariably confined to elderly persons.

After these tumors have been enlarging for a greater or less length of time, the skin covering them begins to shrivel up and is formed into irregular plaits, seeming to have suddenly become superabundant at the same time that it assumes a pewter or leaden blue appearance. This covering becomes gradually thinned, finally bursts and an open sore is established. These ulcers are generally crowded with fungous granulations, which overtop the surrounding integuments and form an ugly red, or reddish brown, protuberance. Some of the sores are slightly excavated and large and very unhealthy granules fill the bottom of the surface. In the fungous varieties, most of the granules are so weak as to break down upon the slightest touch, or even without any apparent cause, and lead to hemorrhage, which, though seldom profuse, is often very obstinate. Bleeding is not common in the excavated cancerous ulcers; but the granules often decay bodily, the surfaces of such sores being variegated with florid, brown or black patches—according to the rapidity of the destruction. The advances of ulceration are usually proportional to the time occupied by the growth of the tumor—being very speedy where the enlargement has been sudden, and *vice versa.* The product of decay is usually thin, of a dark or brownish color, most unpleasant fetor and very excoriating to any part over which it may flow. Gangrenous destruction of the soft granules often occurs—small and foul sloughs being thus cast off in the ichor. Destruction of a cancerous tumor, particularly where it is deeply seated or not of a very degenerate character, may commence before the skin gives way, forming what has been termed an *occult* cancerous ulcer. Decay is not then as rapid as when the surface is exposed to the atmosphere. When suppurative decomposition occurs in this way, a large portion of the carcinomatous mass may become softened before any discharge is seen and a decidedly purulent cast will be given to the fluids that escape. Such cases are not common.

It is after the cancerous ulcer has been thus established that the patient's life is really in jeopardy. The substance of the original tumor is itself destroyed; the adjacent integuments are corroded by the ichor and decay continues to advance, in all directions, along the filiments of aggregated cancerous material. In this way decomposition proceeds through all the adjacent tissues—muscles, glands, ligaments, serous membranes and all other structures, seeming to fall before the chemical power with almost equal facility. The devastations are sometimes frightful, the advances of the affection being likened to an insatiate worm gnawing at the vitals, devouring all before it, sparing no integument and never ceasing its work of destruction till life yields before its ravages. The pain continues incessant and excruciating; the strength fails; the appetite is precarious; the blood loses its true corpuscular vitality; the countenance assumes a bloodless and sallow tinge; the pulse becomes more thready and quick; and the patient sinks from exhaustion—usually suffering intensely to the last.

Another source of serious apprehension after the appearance of a cancerous ulcer, is the great liability to secondary tumors. Generally, only one primitive tumor appears at a time, though there are instances in which several have appeared simultaneously and in different regions of the body, while occasionally the whole frame may be likened to a mass of carcinoma. But even where there has been but one primitive tumor, the accession of ulceration increases the liability to what may not improperly be termed a metastasis—the elements of the tumor seeming to enter the circulation and float to other parts, there to become centers of new enlargements. This multiplication of tumors is sometimes very great—the elements of a single growth spreading to all parts of the system and increasing cancers by twos, fours and dozens. Usually, also, the secondary tumors enlarge much more rapidly than the primary ones, the ulceration of a primary and tardy scirrhus leading to the sudden development of large and destructive colloids. The secondary tumors are almost invariably connected with hyperæmia of the parts; and the material which gives rise to the new enlargements is sometimes of such a corrosive character as to excite considerable inflammation. The extirpation of carcinoma also inclines to a multiplication of tumors, and nothing but the dissection and entire removal of its most remote fibrils can secure the patient against the dangers of such recurrences. As it is too often an impossibility to reach the ultimate ramifications of a cancer, the probabilities of numerous secondary formations are greatly increased by the use of the knife.

Cancer, like scrofula, seems to have a partiality for certain organs, the uterus and mammæ being oftenest afflicted and women being much more liable to it than men. Next in point of frequency of attack are the stomach, the large intestines, the lips, the esophagus and the testes. Other portions of the body, as the bones, the eyes, the liver, the kidneys, the brain, &c., are less frequently afflicted. The different textures of organs seem to have much to do in determining the peculiarities or varieties of the tumors—the breasts, uterus and esophagus, being most liable to scirrhus; the intestines, brain and eyes, to encephaloid; the testes and the lymphatics, to colloid. By this is not meant that these varieties always belong to those localities, but that they appear there oftener than does any other form of carcinoma. There also, as Rokitansky has observed, appears to be "certain relations of sympathy" between afflicted organs, various localities preserving their correllations as well in disease as in health. Thus, an ulcerated or extirpated primitive cancer of the uterus may be associated with secondary development in the ovaries; of the skin, in the intestines; of the stomach, in the rectum; of the testicle, in the kidneys, &c.

These are the more common and well established facts connected with cancer as ordinarily examined by the naked eye. The internal and microscopic examination of such tumors, however, reveals much that is of the highest interest and makes us acquainted with facts touching the composition of carcinomatous tumors which could not otherwise be known. Of late years, indeed, the microscope has been much relied upon in diagnosis, being claimed as the only true means of discerning between malignant and non-malignant growths. Many eminent men have engaged in the discussion of this question, some contending that physical signs are sufficient, and microscopic ones too fallacious, for reliance; while others assert that the magnifying glass never deceives and that the unaided senses are not worthy of our confidence. The prudent practitioner, however, will avoid becoming so wedded to either system of diagnosis as to be unwilling to employ the other.

The internal examination of cancerous enlargements reveals the uniform presence of the following materials, their proportions being different in separate cases. 1st. A fibrous network or stroma, forming the foundation, or web. 2d. Nucleated cells. 3d. A viscous, gelatinous fluid, embracing both the former. There are also found, as accidental components (not essential to a cancer proper, yet helping to give character to sundry varieties of these tumors): 1st. Fatty matter, either floating in the viscous fluid, associated with the cells or intermixed with the fibrous stroma; 2d. Molecules and granules; 3d. Compound granular cells, similar to those which are exuded from pyogenic membranes; 4th. Black pigment, which gives character to that rare variety of cancer known as melanosis; 5th. Earthy matter. Traces of blood vessels exist in every form of cancer, even the scirrhus, while in the encephaloid their number is considerable.

At this point we can not do better than quote the remarks of Dr. H. Bennett (as condensed by Dr. Clymer in Williams's Principles of Medicine), which, although rather lengthy, are sufficiently meritorious to justify us in copying them bodily.

"The fibrous tissue of cancerous growths exactly resembles that found in lymph or in the healthy tissues of the economy. It may be formed either by deposition or by means of cell growth. In the former case, filaments, more or less delicate and closely aggregated, may be seen crossing each other or running in bundles, forming various kinds of meshworks, in which the cells of cancer are deposited. In the latter case we can observe fusiform cells splitting up into fibers and are able to trace their formation from round, oval or caudate cells, till perfect fibers are formed. These cells are of a round or oval form, varying in size from the 1–100th to 1–50th of a millimeter in diameter. Sometimes they possess a distinct nucleus, about the 1–130th of a millimeter in diameter; at others, contain only several molecules and granules. * * These cells, in their different stages of development into fibers, have been frequently mistaken for those of cancer. * * Fibrous tissue may be arranged so as to form loculi, containing a viscous fluid with or without cancer cells, constituting the colloid tissue of authors.

"The nucleated cells peculiar to cancer vary greatly in shape and size. Sometimes we see nothing but oval bodies about twice the size of a human blood globule. * * They measure about the 1–75th of a millimeter in length and 1–100th or 1–120th of a millimeter in breadth. These oval bodies are the nuclei of cancer cells. Sometimes they exist alone, at others we may observe, by careful management of the light, a round or oval delicate cell wall (frequently resembling a mere shadowed halo) in the fluid in which it floats. On adding acetic acid to them, we find the cell wall disappear, whilst the nucleus becomes more distinct than formerly. * * At a more advanced period of development the cell wall is more distinct. * * Dr. Bennett minutely describes the further growth of these cells, showing how they multiplied from cell rising within cell. [Sometimes as many as three and five generations of nucleoli within nuclei have been observed in a solitary cell.] It is owing to this cellular structure that cancer owes the reproductive power which constitutes its malignancy. The cells occur isolated or in groups, surrounded by the other elements of the growth, but more especially by the fibrous tissue.

"The third essential element in cancer is a gelatinous fluid. On cutting through a scirrhous tumor, however hard it may be, we may generally succeed in scraping from its surface a fluid more or less transparent. In soft cancer it is more abundant and contains the granules and cells previously described. In some forms of cancer, however, it constitutes a very large proportion of the mass, presenting a gelatiniform or mucilaginous appearance, varying in color from a pearly white to a deep amber, and in consistence from a slightly viscous fluid to a firm, semi-solid mass. Collections of this kind may occur in loculi formed by fibrous tissue, or in cystic tumors perfectly structureless or containing only numerous molecules and granules. When associated with cancer, however, it contains a greater or less number of the cells previously described, in various stages of their development.

"It is the relative amount of the three essential elements of cancer now described which constitutes its peculiar form. If the fibrous element be in excess, it constitutes scirrhus. If the corpuscles be numerous, encephaloma is produced; and if the fluid abound and is collected into loculi, we call it colloid cancer. There is no other difference between these three forms than this.

"At an early period in the study of histiology, it was natural to conclude that a certain *form* of the cell should be thought characteristic of cancerous growths. The observations of Muller led to the belief that the caudate and spindle shape of this minute structure was peculiar to them. Hence we find him confounding certain tumors long denominated sarcomatose, and which wholly consist of fusiform cells, with cancerous or malignant growths. These, however, have no power of reproduction; and, although often associated with cancerous cells, should not be confounded with them. From the results of many examinations, Dr. Bennett is satisfied that there is no one form of cell which can be considered as at all times characteristic of cancer. The caudate and spindle shape of these bodies is common to fibrous structures in general, frequently seen in lymph and especially in the exudation forming the granulations on ulcers, recent wounds, &c. * *

"Dr. Bennet states that he is not aware of any tissue in which a fibrous and a cell structure, such as has been described, were combined; and he is, therefore, inclined to think that whenever we find cells of this kind deposited between the meshes of a filamentous structure, we may be satisfied that cancer is present. If we trust to the form of the cell alone, we may confound epithelial growth with cancer; if we trust to the fibrous elements alone, we may mistake sarcomatous growths for it."

It gives us pleasure to thus acknowledge our indebtedness to the learned Dr. Bennett, whose views are now generally accredited by the profession, subsequent observations having demonstrated their correctness on all essential points. In addition, it may be mentioned that the whole of a cancerous tumor is frequently, but not always, found inclosed in a thin and somewhat pellucid cyst. This, however, soon breaks down upon the accession of ulceration.

The composition of carcinomatous enlargements has been a knotty question among physiologico-chemists, and various investigations have been made with a view of better determining this question. Prominent among the investigators have been Hecht, Foy, Wiggers and Morin. The combined testimony of these gentlemen assures us that, in all cases, cancerous matter is composed mainly of albumen, fibrin and gelatin, with various fats and earths—the latter being chiefly in the form of carbonates. The proportions of these several constituents differ considerably in the several forms of carcinoma; but the single fact remains conspicuous throughout, namely, that degenerated albumen and fibrin are predominant. In this respect, the resemblance of cancer to scrofula is most striking; and it would seem as if the addition of the fats and earths was all that made one differ from the other. That there is but a step between the lowest forms of scrofula and the most promising forms of cancer, has long been felt by most observers. There are enough positive differences to clearly separate them in all cases, yet enough similarities to almost couple them, placing one below the other, as so many rounds in one grand ladder of nutritive or albuminous degeneracy. The materials entering into the substance of cancerous tumors are not of so corrosive a character as those of scrofula or as those which accumulate in the system to become the centers of abscesses, boils and carbuncles. The justness of this remark will be at once seen in the fact that cancers run a much slower course than either of those forms of disease, ulcerating much more gradually because the components of carcinoma are not so destructive to the living tissues. This does not interfere with the known malignancy of the affection, the malignancy being readily accounted for by the fact that decomposition of the tumors does not usually commence till the body is much exhausted by the amount of the accumulations. The ichorous quality of the discharge is due to the slowness with which the decomposed particles are cast off (see p. 121).

Various opinions have arisen, and much discussion has been provoked, concerning the mode of carcinomatous development. There is even yet a good deal of diversity in the sentiments of different investigators, and this is a field in which those fond of the fanciful can find much to interest them. For ourselves, we confess to an unformed opinion on the subject; and, as hypotheses are rarely profitable, we will not attempt the least dogmatism on the question, but will merely give the three principal views advanced at different times, together with a synopsis of the argumentation by which each has been supported.

1st. Cancer has been considered of *animalcular* origin, to be literally dependent upon the gnawings of some peculiar living thing. The anomalous character of the pain, the fact that many forms of cutaneous disease are occasioned by animalcules and that various insects have been at times found in the most hidden portions of the body, are the grounds upon which many rest their belief.

2d. By others, carcinoma has been considered a mere *exudate*, as are the tuberculous or scrofulous enlargements. This opinion has mainly rested upon two observations: *first*, the almost imperceptible progress of development, especially at the commencement of the tumors; *second*, the absence of any thing like a full circulation in the great majority of tumors.

3d. The most popular opinion is, that cancer is a distinct, vital growth, an increase dependent upon cell germination—the unwholesome character of the growth being a consequence of insufficient elaboration of the lymphy materials entering into the cells. This view has its chief foundation in the fact that the cells, in cancerous tumors, are so liberally provided with the means of self production in the shape of nuclei and nucleoli. It is also noticed that these nuclei and nucleoli are actually developed into new cells, which, however, do not always in turn possess their nuclei. The rapid development of secondary cancer after ulceration or extirpation of the primary tumor, has also been considered as favoring this view—it being claimed that the cells of the old cancer are taken up by the circulation when the hardened limits of the original tumor are softened by decomposition or loosened up by the knife, and, being thus transplanted to new soil, grow with increased vigor at the expense of the unexhausted tissues there found.

It has also been questioned whether these tumors are of local or general origin; whether they spring from some inefficiency in the part or have their foundation in some constitutional peculiarity. Slight accidents, as blows, bruises, pressure and friction, are commonly observed to be the forerunners of a carcinomatous development—giving rise to the belief in their local character. It can scarcely be supposed, however, that such trifling injuries would lead to these malignant results, unless there was a previous basis in the system. At least, such a sequence from those influences would be altogether unprecedented in pathological history; and it seems much more consistent to place the injuries in the light of *provoking occasions*, the *actual cause* being more deeply seated and, as yet, not fully known. It does not conflict with this opinion to say that we have not yet, as in scrofula, discovered any constitutional evidences by which the cancerous liability or tendency may be detected. More careful observations may make such witnesses known to us. Certain it is, however, that, after a cancerous tumor has continued for a length of time and its ulceration has begun to debilitate the frame, we find palpable proof of the systemic contamination. The skin, especially the face, becomes of a peculiar sallow purple, or an earthy kind of diffused yellow, color. The features are pinched, the eyes sunken and the whole countenance expressive of anxiety. Brown spots, of scales or dandruff, also appear upon various parts of the surface; there is much pain through the system and a feeling of great lassitude weighs the patient down. The appearances can not be well described, but are not to be forgotten by him who has once seen them clearly marked.

Scirrhous Form of Cancer.

The scirrhous, or hard, form of cancerous tumor is that which is most common, its occurrence being so frequent that the term scirrhus has been attached to every form of carcinoma. True scirrhous cancers are hard, dense and heavy, and feel as if a stone were imbeded in the integuments. Such tumors are at first small, grow slowly, generally limit themselves to the dimensions of a plum and rarely surpass the bulk of a good sized orange. At first they are clearly movable, but, as they advance, attach themselves to the adjacent integuments and become fixed. The mammæ and uterus are peculiarly liable to this form of cancer, though other portions of the system may be affected. It seldom occurs till after the middle period of life.

Scirrhus exists in several different forms: 1st. As small *tubers*, of which there may be several in the same tumor. Their shape may be round, conical or ovoid, especially when they exist singly; but when many of them are found together, they are usually angular and more or less irregular. 2d. As thin *lamellæ*. This mode of arrangement is mostly found in scirrhi of mucous and serous surfaces. 3d. As an *infiltration*, which is more uncommon than either of the preceding forms.

Scirrhi derive their hardness from the superabundance of fibrous structure which enters into their composition. They contain few cells; the gelatinous fluid is in minor quantities, yet always present—being sometimes arranged in waves which give the mass a striated or recticulated appearance, at other times existing in a diffused form among the fibers and again being collected in cysts. In some cases these gelatinous cysts are so numerous and large as to give the tumor the compound character of a scirrhous and colloid cancer. Distinct hydatids are occasionally found in scirrhi; pus is more rarely met with and blood vessels are but sparsely intermixed.

A scirrhus cuts firmly and usually grates under the knife. The severed mass presents a somewhat glassy surface, which may be tinged gray, leaden blue, faint rose or drab. The substance is firm, opake and partially elastic. The fibrous structure is usually greatest in the center, from thence spreading outwardly and running through the parenchyma of all the surrounding organs. The extensions of the tumor fill up the small blood vessels and occupy the adjacent lymphatics, from which facts they have been termed *cancer roots*, and are described as drawing vitality from these parts and nourishing the central enlargement in the same manner that vegetable spongioles gather nourishment for the trunk.

Scirrhus both enlarges slowly and ulcerates slowly—its materials seeming to be of the least corrosive character and leading to destruction only after the lapse of months or even years. And when ulceration commences, its advance is very slow—the opening often requiring months to give it an increase of an inch in circumference. The edges of these ulcers are almost as hard as cartilage and consist mainly of an association of cancer *roots*. They are sometimes of the color of cartilage, again ashy gray or tawny—rarely red and angry; they are jagged and completely everted. The surface of the sore itself is soft and pulpy, as if in a semi-putrescent state. Granules appear only in spots and are of that tender, fungous character which shows an utter incapacity to enter into the formation of any kind of structure. The discharge is free and of the thin, sanious and excoriating quality before mentioned—also possessing the peculiar fetor of all cancers.

The destruction is not always by simple ulceration, but frequently proceeds to actual gangrene, the sloughs being often of considerable size though slowly loosened from the parts underneath. Pain is constant, of a burning character and usually extending along the adjacent lymphatics. The advance of the enlargement is always toward the lympathic ganglia, it being peculiar that layer after layer is added to the extremities of the so called " roots " till they are extended to surprising distances. The new enlargements partake of all the characteristics of the original tumor, being at first soft and movable and afterward becoming like dense, wiry cords. When large portions of the lymphatics of a part become thus affected, extensive edema follows, the pain along the new tracks becomes of the most excruciating character and secondary tumors (of more rapid growth) appear in the connected ganglia.

Wasting of the frame in scirrhus is very great, the feebleness and emaciation being truly alarming and showing complete undermining of the constitution, which renders vital resistance to the encroachments of disease an impossibility. It is peculiar, also, that the bones become very frangible, being liable to fracture upon the most trifling accidents and thus frequently presenting a complication that makes more labor for the already insufficient life power and thus hurries on the fatal issue.

Encephaloid Form of Cancer.

Encephaloid cancer has been variously termed encephaloma, medullary sarcoma, fungous hematodes, &c. It is of a much softer structure than scirrhus and has a pliant and decidedly elastic feeling. It is accompanied with persistent, lancinating pain, grows very rapidly and reaches a great size, sometimes attaining to the dimensions of an adult head. The skin over these tumors is generally smooth and movable at first and ultimately becomes corrugated and attached to them. The tumors are always very freely supplied with blood vessels, their soft structure not interfering with the current of the circulation; the veins can usually be seen ramifying immediately under the skin and appear like tortuous purple lines over the surface of the cancerous mass. Sometimes the blood vessels break down, the fluid extravasating through the tumor and giving it a purple or brownish appearance upon the surface.

This variety of carcinoma is found at a much earlier age than scirrhus, and infants are sometimes born with a fungous hematodes upon sundry parts of the body. Between the ages of twenty and thirty, however, seems to be the period most liable to such developments. The eye seems to be quite a favorite seat for its appearance; next come the testicles and scrotum and the abdominal cavity, and the axillæ and mammæ are next in turn. It occurs, like scirrhus, in three general forms, namely, as *tubers*, as *strata* and as an *infiltration*. Sometimes, as on serous surfaces, the tuberose encephalomæ are pear shaped and are attached to the sound organ by a slender peduncle.

Encephaloma yields readily before the knife. It is composed of a light layer of fibrous structure and a profusion of cancer cells. The cells are mostly spindle shaped, occasionally ovoid: the color of the mass is usually a cineritious gray—but every shade of color between this and the murky brown of crassamentum is found in what are classed as encephaloid tumors. When the tumor is cut, the exposed ends of the blood vessels are distinctly seen, always giving a red and mottled appearance to the mass. Blood is very frequently found in the substance of the tumor, being sometimes coagulated but oftener in a fluid state. The mass itself is usually of a pulpy consistency, while a considerable degree of fibrous solidity is found in some cases, an almost creamy softness accompanies others, and the hard and soft forms exist together in still others. Such facts show to us the importance of not seeking to make too many nice distinctions in any general order of disease; for species will run into one another so imperceptibly, that the most minute examiners will often be baffled in trying to discriminate between them. The chief distinctions between scirrhus and encephaloid are found in their relative softness and rapidity of growth; yet it cannot be doubted that the internal characteristics of each may be so blended with those of the other, as to obliterate all nicer points of difference. Encephaloma is the lower, the more degenerate and the more dangerous of the two, and scirrhus not unfrequently degenerates into it, just as an ordinary ulceration may be lowered to the point of rapid sloughing or even fall into actual gangrene.

Encephaloid cancer, from its greater malignancy, destroys the skin and appears in the form of an open sore much sooner than scirrhus. The surface of the ulcer usually protrudes like a huge fungus, is soft, of a bluish brown or muddy pink color and liable to hemorrhage upon slight accidents. The discharge is profuse, grumous and uncommonly fetid. The surrounding integument wastes away constantly; the fungus continually ulcerates and occasionally sloughs; the sore spreads rapidly, causing extreme prostration and speedily terminating the patient's life. The liability to reproduction is very great in these cases, and it is seldom that more than a few weeks from the day of ulceration elapse without the development of numerous similar enlargements in various parts of the body. In a remarkable case, reported by Velpeau, the cellular membrane, muscles, bones, lungs, heart, stomach, duodenum, intestines, pancreas, kidneys, liver, coats of the gall-bladder, dura mater and thyroid gland, were all more or less affected.

Colloid Form of Cancer.

This has also been called gelatiniform cancer, gum cancer and alveolar carcinoma. It seems to hold an intermediate position between scirrhus and encephaloma, possessing its own characteristics, yet being liable to pass into either of the others. It is more rapid in its growth than scirrhus, less so than encephaloma and possesses an intermediate degree of firmness. It does not often attain to a large size, and the pain accompanying it is rather dull than otherwise.

In composition, the colloid variety of cancer consists of numerous whitish, fibrous interlacements, which embrace bags or cysts of a transparent, gelatinous, or jelly like, fluid. The cysts containing this fluid are of a very delicate structure, resembling the serous membranes; they vary in size from a millet seed to a bean, are very numerous, form an almost granular looking surface when cut into and have intercommunications one with another. The fluid within the cells is various, though usually of a pale straw color tinged with green, tremulous, tenacious and transparent. In the older cysts it is not unfrequently opaque and of a creamy consistency. The cysts are crowded with cells containing nuclei and nucleoli; but the development from these germs takes place very slowly in all cases, and, in some cases, the nuclei seem to remain stationary. The bones, joints and serous membranes, are most subject to colloid cancer. Adults are alone liable to it: it is not as fatal as the other varieties, is tardy in coming to the point of ulceration, does not multiply very rapidly and is much more amenable to treatment.

Melanosis.

Melanosis, or black cancer, is one of the most anomalous developments to which the system seems liable; for, though it possesses the general characteristics which define the carcinoma, its color and the substance upon which that color depends, render such tumors very peculiar. They are found of various hues, from a heavy black to a mottled blue black, being sometimes also of a dull stone color, with black striæ running through them like veins in marble. These hues seem to depend upon the presence of numerous pigmental bodies which are mixed up with the fibrous stroma and nucleated cells of the other forms of cancer. The whole tumor is opaque, of a greasy feeling, slow in formation and not accompanied by much pain.

These tumors occur at various portions of the body, the skin being particularly fertile in them. They may be tuberose, pedunculated or infiltrated in form. They soften slowly, seldom breaking down the integuments till the whole mass is in a pulpy state. An inflammatory action is then established and the rotting substance is ejected in a mass—this being an encysted rather than a diffused enlargement. A cavity is thus left, which may remain in the form of an ulcer, or it may be filled with lymph and ultimately obliterated. Secondary melanotic tumors are seldom developed, though the primary tumors are sometimes so numerous as to almost occupy the entire body. Gross (Pathological Anatomy, p. 146) thus refers to a case reported by Dr. Norris of England: "Not only was the external surface extensively studded with black tumors, but immense numbers were seen scattered over the stomach, intestines, mesentery and omentum; the lymphatic ganglions, kidneys, pancreas and liver, were also more or less affected; the lungs were thickly mottled throughout the greater part of their texture; and the heart was literally incrusted with them, both externally and internally." The influences at work in bringing about such pigmental increase, are as yet unknown.

Treatment of Cancer.

The treatment of cancer has not, in general, been attended with any very cheering success. So far as the recommendations of authors are concerned, much benefit could not be anticipated, for nearly all the means that have been advised are of a character better calculated to assist disease than nature. Fortunately, the use of such means has been so invariably followed by mischievous consequences, that writers have almost ceased to mention the employment of any thing but the knife. Practitioners of the Physio-Medical schools, however, have had encouraging success in the treatment of this form of disease; and, while we must still admit the very baffling character of carcinoma, enough has been accomplished to prove that the right path has been entered upon and to encourage us in the more earnest investigation of the malady and the proper method of treatment.

Four general methods are brought to bear in the management of these tumors, namely: 1st. Constitutional renovation; 2d. Destruction of the substance of the cancer by mild escharotics; 3d. Consolidation of the materials composing the tumors, so that they may be separated from the surrounding integuments; 4th. Extirpation. The first two of these are the modes usually employed, the third one being also sometimes resorted to in connection therewith. Extirpation, when employed at all, is always a dernier resort. We will consider each class of means separately.

1st. CONSTITUTIONAL MEANS.—At the very foundation of treatment must be placed those measures which are calculated to drive all impurities out of the system, rid the body of every description of foulness and set every secreting and excreting organ to work, that the fluids may thereby be purified and a healthy digestion and assimilation provide wholesome nutrition for the frame. Any course of management which fails to begin thus, is defective—two things being positively necessary before any success can be rationally hoped for in the treatment of carcinoma: *first*, the removal of all impurities which weigh down the activity of the constitution; *second*, the invigoration of the system, that the vital power may have an opportunity to offer its most earnest resistance to the encroachments of the malignant growth. Even if it is allowed that cancer is wholly of local origin and not the consequence of general impurities, the ultimate impregnation of the system by the carcinomatous matter can not be denied, and the impossibility of affording relief without casting out those materials, must then be admitted. But if it is at first acknowledged that the substance of the tumors had an intersanguine existence, and that the enlargements are dependent upon the accumulation of these impurities, then their riddance from the system becomes a positive necessity. In whichever light it is viewed, then, constitutional means become of the first importance; and the malignancy and (apparent) propagating capacity of some of the cancerous elements, show that none but the most thorough and energetic means are to be relied upon.

The skin is probably better adapted than any other organization for the removal of impurities. The appliances best calculated to open it are also potent in increasing the activity of the absorbent vessels, by means of which the substances of the tumors may be retaken into the system preparatory to being cast out. Many cancers have been spontaneously cured, as it is termed, by the absorption of the materials and their subsequent ejection by the various secernent organs; and, as it is the practitioner's duty to aid nature, nothing can be more rational than to imitate her by following in the path which she at times treads so successfully. In doing this, no means can be at all compared with the vapor baths, regularly and thoroughly applied. We advise their daily use, the temperature being moderate and the time of application as long as is agreeable to the patient, that the skin and absorbent system may be deeply influenced. The free use of the aromatic teas should be joined with the baths, to aid in gaining an outward flow of blood and sustaining the nervous and arterial systems. Sage, ginger, asarum, mint, hedeoma and similar agreeable articles, may be used for this purpose, small proportions of capsicum being added in those cases where there is decided feebleness of the pulse and general want of warmth in the system. Wet sheets are employed instead of the vapor bath, but are inferior to it in point of utility.

Besides the perspiration, all the other excretory functions of the body must be aroused; for which purpose the use of alterant and tonic agents must be resorted to. As the design is not so much to arouse a torpid organ as to make ways of escape for the disease-creating substances, all the secernent organs must be employed, that the multiplicity of channels may give the freest opportunity of exit. Among the agents which may be used for this purpose, rumex, arctium, stillingia and sarsaparilla, may be chiefly mentioned. Guaiacum, euonymus, leontodon, aralia and similar articles, may also be employed. It is nearly always necessary to add some of the purer tonics to these, the system requiring to be sustained and strengthened in order that it may be the better able to perform the new duties of elimination urged upon it. Populus, aletris, hydrastis, gentiana, sabbatia and others of the kind, may be selected, those of a somewhat stimulating character being best, the proportions to be used being small. If guaiacum, sarsaparilla or other stimulating alterants are employed, the relaxing tonics, as verbena, coculus palmatus, cornus or eupatorium, may be selected. Or if both the alterants and tonics are of a relaxing cast, small quantities of capsicum, xanthoxylum or other pure stimulant, may be added to them. It is best for the practitioner to make his compound as pleasant as possible; for it is necessary to press these agents in large quantities in order to derive the fullest benefit from their influence. A pleasant flavor may be given by the incorporation of a little sassafras or wintergreen.

In furtherance of the same general design, it will be important to keep the stomach cleansed, by the use of emetics, whenever that organ becomes clogged with impurities. This great outlet for morbific materials is liable to need much attention in some cases, while in others but few emetics may be called for. The practitioner is to employ this means according to the evidences of its necessity, always remembering that there is no process at all comparable to it for efficiency when the stomach requires purification.

The diet and habits of the patient can not be too carefully guarded and every circumstance which can have the least deleterious influence upon the system must be judiciously provided against. Of diet, we would recommend a wholly vegetable course, which is least likely to stuff the system with foulness and best calculated to keep open the secernent organs. Warm clothing, fresh and dry air, plenty of light, good water and pleasant society, must also be provided, as far as possible.

2d. Destruction by Escharotics.—To destroy the substance of cancerous tumors by various caustic appliances is an old method, having been employed almost from the earliest period of surgical practice. No proper discrimination, however, has been made as to the strength of the escharotics to be used; and, as the idea seemed only to be that of corrosion, those agents which were the most powerful were usually selected. This was bad practice; for it is only the carcinomatous substance that calls for destruction, and the living tissues interspersed with the mass of the tumor should be preserved uninjured, *if possible*. Surgery seeks always to preserve, even while it destroys; and the eradication of disease is never to be accomplished by the sacrifice of a single living fiber that can be saved. If cancerous material can be demolished by those escharotics which are harmless to the sound interstructures, an important end will be attained; when these have failed, it is quite time enough to resort to those which have power to break down both the living and dead structures. It is the discovery and application of those caustic agents which can be classed under the first order, that has given Physio-Medical practitioners such superiority over all others in the eradication of carcinoma.

It must not be forgotten, however, that there are instances in which the more potent escharotics are called for. In this category are included those cases where the cancerous mass so far outweighs the proportion of normal tissue imbedded therein, that it is evident the former can not be removed in any way that can leave the latter in a healthy or usable condition. This may be the case in any form of carcinoma, but most frequently occurs in scirrhus. When it is evident that the living interstructures can not be saved to any advantage, the prompt removal of the whole is advisable, and such caustics must be applied as will do the work with the least loss of time. Only the centers of these tumors require to be treated in this way, it being quite impossible to reach, and wholly unwarrantable to attempt to reach, the radicals, or "roots," of a cancer, by any such means. Ulceration may sometimes be started in the center of a scirrhus by the more powerful corrosives, their application breaking down the integuments and thereby making an early way of escape for the malignant materials which the vital power is not able to cast off nor the chemical force to destroy.

Of the mild escharotics, the following may be mentioned as the most important and reliable: 1. *Oxalis acetosella* and *stricta*—the whole herb is used; 2. *Trifolium pratense*—the heads, while in full blossom, are employed; 3. *Phytolacca decandra*—the fresh green leaves are the parts used; 4. *Fraxinus acuminata* and *sambucifolia*—the whole bark of the trees is put to use; 5. *Carya alba*—of which the bark of the tree is the valuable part; 6. *Sanguinaria canadensis*—the root of which is used.

These articles are used by being carefully formed into a stiff extract and then applied as a plaster. The first three mentioned are the mildest and altogether preferred to the other three, which are much stronger and may, in feeble persons, be found quite powerful enough for the destruction of some of the more yielding living fibers. Dr. S. Thomson was in favor of the trifolium, while Dr. H. Howard was equally fond of the oxalis. The plasters should be made quite thin and just large enough to cover the ulcerating surface. The application always occasions more or less sharp pain, which, when too severe, may be mitigated by mixing the escharotic with balsam of fir, ointment or extract of the rumex crispus or celastrus scandens, or the powder of scutellaria, cypripedium or asclepias tuberosa.

In scirrhus, these applications may not need changing oftener than once a day, though every twelve hours is preferable; in encephaloid and colloid cases, not more than twelve hours should be allowed to pass without a renewal of the plaster. Upon removal, it will be found that its presence has led to more or less destruction of the tumor and a purulent and fetid discharge has been formed. The parts must be well cleansed before the escharotic is reapplied. Medicated washes may be employed at these dressings, as infusion of dock, willow, golden seal, dogwood, &c. Epiphegus virginianus, any of the querci, or goodyera pubescens, may also be used. When there is much foulness upon the surface of the sore, myrica, xanthoxylum and myrrh, may be used to cleanse it, especially when there is more stasis than action in the surrounding capillaries. Under this management the tumors disappear with a degree of rapidity proportioned to the solidity of their structure and the frequency of the applications.

Besides the direct application of caustic to the ulcer, various poultices may be employed upon the unbroken tissues around and over the sore. These should be chiefly relaxing, or of a character calculated to soften the tissues, render the carcinomatous accumulations more pliant and prepare the living parts for the expulsion of the putrid materials. Rumex and convallaria are good for this purpose; arctium, baptisia, and cornus florida with ulmus, are also much valued. Conium and cicuta have been extolled in this connection, but their highly narcotic properties forever exclude them as remedial means. Salvia lyrata, calendula officinalis and celastrus scandens, are also much prized; good constitutional treatment and celastrus alone being accounted almost equal to overcome ordinary scirrhus. These poultices should be applied liberally, changing them frequently and keeping them moist and warm. They may also be used before an ulcer appears or is made by the practitioner; and instances are not wanting in which such means (especially bittersweet and the docks), assisted by thorough constitutional management, have prevented the tumors from ulcerating, kept them in abeyance for a whole life-time and even removed them entirely.

When the tumor is so dense, that the first three caustics in the above list will not influence it, any of the last three may be employed. They may be molded into a stick and inserted boldly into the ulcer and carried over its whole surface. This may be repeated once, twice or thrice a week, as occasion may seem to demand, and should always be followed by an elm poultice. It is a very painful operation and destroys both living and half dead material; but this is necessary in these cases, as no time is thus lost in attempts to preserve a meager portion of interspersed tissue which it is impossible to save. So, when the cancer has not yet begun to ulcerate and the toughness and ruggedness of the covering integument give evidence of the inevitable slowness of the chemical process, a small lump of potassa fusa may be moistened and bound on the part in order to reach the cancerous materials sooner. When the practitioner has reached what he is warranted in considering a portion of the tumor where the carcinomatous development is not greater than the proportion of sound tissue existing through it, recourse is to be had to the milder escharotics, that the integuments may be saved as much as possible.

3d. CONSOLIDATION.—By this is meant the astringing and contracting of the cancerous mass, so as to loosen it from the surrounding living integuments that it may then be drawn away. This has been frequently done and the cancer thus extracted in a mass, showing its center and many of the branches shooting off from it. The result is accomplished upon the well known principle, that the less vitalized a part is at any time the more easily it is constringed, and as the material of cancer possesses far less life power than the living parts around and beyond it, the application of consolidating means will cause it to shrink much more than the normal structures.

The means employed for this purpose are those of a highly astringent character. Quercus alba, diospyros virginiana and epiphegus, are the articles most in use. They are formed into a concentrated mass and then incorporated with some cerate and applied in the form of a plaster. Or some of the caustics and astringents may be mixed together and applied, by which the cancer will be contracted and destroyed, at the same time that the large outward poultices will soften the living tissues and give more room between them and the carcinoma. This course has been pursued with much success and is now a favorite among our practitioners. The extract of sorrel, black ash and persimmon, in equal proportions, and moderated by the addition of beeswax, suet or other unguent, has given much satisfaction, though of course the two classes of agents can be compounded at pleasure.

Of late, the process of consolidation by the use of some of the freezing mixtures has come into vogue. The mixtures which may be most advantageously employed, are, sulphuric acid and sulphate of soda in equal parts, or two portions of finely pounded ice to one of common salt, the latter being altogether preferable. By the application of such a mixture to the seat of a cancer, a few moments will suffice to greatly contract it and benumb the living tissues, the application being removed before these are chilled to the freezing point. Gentle traction is then made upon the mass in the center of the tumor, to be followed by a poultice of ulmus over the whole. By thus alternately contracting and relaxing the mass and making gentle traction, at the same time keeping up a vigorous constitutional treatment, a few days may suffice to so loosen the cancer as to admit of its removal. We have never witnessed the process, though practitioners in whom we place confidence say they have employed it with success. This procedure is only applicable to recent cases.

4th. EXTIRPATION. We at once enter our protest against that free use of the knife which is so flourishingly recommended by nearly every modern author upon surgery. To make extirpation the beginning and the end of treatment, looks more like a desire for operative display than a solicitude for the patient's well-being. For the success attendant upon the use of the knife has been anything but encouraging, the number who have been saved thereby being far fewer than those who have been hurried into the grave through its employment. Indeed, it could scarcely be otherwise; for the far-reaching roots of a cancer usually extend so much beyond the point that would be rationally selected for incision, that the radicles can not be expected to be removed in one case out of twenty-four. The liability to secondary tumors is immediately and greatly increased and death hastened by this procedure. A rash resort to the knife is wholly inadmissible, no operation being allowable till the above-mentioned means have been fully tried, and then only as a dernier resort and with a mere possibility of saving the patient's life a few years longer. When an operation is actually deemed necessary, offering the prospect of doing a temporary good, the mode of excision will depend upon the organ affected, as will be described in various portions of this work.

In drawing this subject to a close, we would remind the student that he must not place too high an estimate upon his ability to cure cancers. The means we have mentioned are potent and their proper and persevering application has been attended with encouraging success. Yet the malady is a most malignant one, and very, very far from being easy of eradication. The encephaloid form is particularly intractable, and when an internal organ is affected by it anything but the most transient relief may at once be counted as an impossibility. We have written thus lengthily upon the subject, because it is one full of importance and interest; and we hope our practitioners may be aroused to a more careful investigation of such cases as they may meet and report the treatment they employ, that more information may be obtained upon the nature and management of this most malignant form of disease.

CHAPTER VIII.

VENEREAL.

General Remarks.

FROM a date long prior to that of reliable medical chronology, the human race has been subject to various forms of disease consequent upon impure sexual intercourse, depending upon a specific virus and transmissible from one person to another without limit. From their common propagation by the illicit votaries of Venus, these forms of disease are known as *venereal* complaints.

As a class, venereal forms of disease are divided into two orders: 1st. *Gonorrhea*, which chiefly affects the urethral mucous membranes, excoriating them without deep destruction and leading to the discharge of a peculiar pus. 2d. *Syphilis*, which affects various parts of the external genitals of males and the vagina and uterus of females, causing ulcerations. Both these orders may lead to secondary symptoms, or accidents, by absorption of the virus into the system. Those accidents which follow upon gonorrhea are mostly of a trifling character; those which proceed from syphilis are serious, often undermining the constitution and not unfrequently leading to death.

The origin of the venereal poison is quite unknown, both as to date and manner. Many speculations have been entered into and a dozen different propositions have been lustily sustained with an ingenuity which would challenge our admiration, if employed upon a more practical and useful subject. Unfortunately, for the satisfaction of the disputants, all their plausible arguments fall into nothingness in view of the truth, that not a single substantial fact exists in support of any of them. It seems *probable*, that all of these forms of disease arose from that uncleanness and impurity which was likely to prevail among persons who could give themselves up to libidinous associations. We know the tendency to a rapid degeneracy of any degree of ulceration about the female genitals, and instances are by no means wanting in which husbands have become diseased by copulation with wives innocent of everything but a leucorrhea. And when we reflect that the harlots of olden times, as well as of the present, were likely to have connection with men of every kind of habit, it can not be wondered at that peculiar forms of disease were left behind, to be fostered into virulence by the peculiar character of the female generative organs. It seems quite possible for the same thing to take place at the present time. Yet the common suspicion resting against the lewd, subjects them to the imputation of having had some previous intercourse with the impure.

Venereal is most usually propagated by connection with those already affected, and when it occurs upon the genitals, there is always the strongest probability that this is the case. Yet it is quite possible for it to be communicated through other sources. A portion of the syphilitic virus introduced under the skin, will lead to an ulcer exactly like that from which it was taken. Or, if it gets into a cut or scratch and is not washed out quickly, it will lead to the same result—a fact of which practitioners are sometimes painfully aware. Even upon the genital organs it may be developed by contact of the parts with virus scattered on the seat of a water-closet or on towels in a public bath and by wearing some of the clothing of the diseased. The secondary symptoms are very frequently transmitted by the parent to the child, usually coming from the father's side—woman thus affected rarely becoming pregnant. Yet a pregnant women may contract it and the virus work but slight mischief in her own system, but develop itself in her offspring in the most violent secondary forms. Suckling children thus poisoned have been known to convey it to their nurses' nipples. In all these cases of indirect contagion, syphilis is most commonly the form propagated; yet gonorrhea may be thus multiplied, as when this discharge gets to the anus, eye or other mucous surface.

Whenever any form of venereal disease is conveyed from one person to another, no matter at what part the contagion may take place, the new difficulty is the counterpart of the old; and the new sores and discharges, thus resulting, possess all the virulence of those from which they were derived—being in turn capable of conveying it to other parts and persons. In this way it may be spread without limit, communication of person with person being capable of poisoning a whole nation from the virus of a single infected individual. It spreads much more rapidly from woman to man than from man to woman.

It has long been a matter of discussion, among medical writers, whether gonorrhea and syphilis were the result of two special poisons, or of a single specific virus. The fact that the genorrheal discharge will not lead to ulceration, while the syphilitic poison always reproduces a chancre, has been chiefly relied upon to prove that the two are separate and distinct. But it must be remembered, that the skin is possessed of a stronger power of resistance than the mucous membranes, and hence a poison which barely excoriates the latter could scarcely be expected to do much damage to the former, but would rather be cast off altogether. For the same reason, a virus powerful enough to destroy the skin in the form of ulceration, must certainly be expected to be capable of similarly affecting the lining membranes of the urethra, which are of a much more yielding texture. In consonance with this opinion are the well known facts relating to the secondary accidents; for the absorption of gonorrheal poison is but slightly serious, while systemic impregnation with degenerated syphilis is a grave misfortune. So, persons of healthy body and good habits, who become injured by an ordinary syphilitic contagion, very frequently resist it so effectually that it does them no harm, but heals up readily; while the feeble and the uncleanly who contract a simple gonorrhea, will be so incapable of resisting it as to allow it to degenerate till it becomes sufficiently powerful to cause actual superficial ulceration. Such considerations as these strongly favor the opinion that they are but one virus—the different results arising from differences in degrees of degeneracy; and *these* differences may result from strength or feebleness of constitution, cleanliness or uncleanliness of person, invigorating or debilitating habits, &c. At least, such conclusions are in entire conformity with well known facts concerning the healthiness or unhealthiness of pus and the results that will follow the application of a purulent discharge to tissues of various resisting capacities.

Principles of Management.—Whether venereal forms of disease are of ancient or modern origin, a visitation of Divine wrath or the result of human disobedience to the physical laws, a single virus under different forms or two distinct and specific poisons, the management will not be at all affected thereby. Hence the settling and unsettling of these questions may be safely left to those who take a special fancy to speculation, while we devote our main attention to items of practical importance.

The idea of discovering some chemical that will neutralize the venereal poison after it has found its way into the system, may as well be discarded at once; for man is not a chemical machine, but a vital organism, and no form of disease can be cured on any other than vital principles. The aim of the practitioner, therefore, must be to assist the vital power in its efforts to cast out the virus, to invigorate the frame that it may be able to successfully oppose the progress of the corrosive, and to destroy as little tissue as possible. These principles must be constantly kept before him, the means and modes to be selected for these purposes differing according to the seat, extent and surrounding circumstances, of each class of cases.

Gonorrhea—in Males.

Gonorrhea literally signifies a discharge of semen—a meaning quite inapplicable to this form of disease, yet now rendered familiar and significant by common consent. It is also known as *Blenorrhagia* and *Urethritis*. Unprofessionally, it is called *clap*. These terms are applied to that muco-purulent discharge from the male and female genitals which is observed to take place after copulation with those already affected by a similar discharge.

Speaking first of the male, we find that the mucous membrane at the orifice of the urethra is the point infected during copulation and the first evidences of the contagion are found there. These evidences consist of a slight tingling or itching, which occasionally extends over the whole glans and is shortly followed by a little thin and whitish discharge. This discharge may not be seen without slightly squeezing the end of the penis. The edges of the urethra become reddened and swell a little and the orifice gapes. The passage of urine commonly increases the sense of itching.

In the course of time, which may vary from six hours to as many days, the virus advances further along the urethra and affects the membranes more deeply. The itching becomes a keen, smarting pain, which is greatly increased during micturation. The penis swells more or less, being crowded with blood and not unfrequently suffering, at the glans, from the ordinary throb of an active inflammation. At the same time the discharge becomes much more profuse. It is mostly white with a yellow tinge, though it may have a green or brownish-green cast in very bad cases. This discharge is thick and stains the linen a yellow, or greenish-yellow, color. The prepuce is drawn tightly by the tumefaction and gives the glans a plump, shining appearance. In rare cases, the whole glans is excoriated and a thin discharge oozes out over its surface. The mouth of the urethra is always more or less excoriated and the whole of this portion of the organ is very tender, with a general tenderness along the under side of the penis through the course of the urethra. The urethra is narrowed by the determination of blood and micturation is exceedingly painful, the stream passing away more or less narrowed, twisted and broken; the inclination to urinate is more frequent than usual. Painful erections of the penis (*chordæ*) are common and the rupture of small blood vessels may give a red tinge to the discharge. There are always constitutional symptoms present during this period, as, a febrile effort, thirst, pain in the head and back, loss of appetite, costiveness, &c.

The acute symptoms may continue from ten to twenty days, when they gradually decline and the gonorrhea passes into the chronic stage, or *gleet*. Inflammatory resistance to the virus is slight, the swelling and pain nearly disappear, the discharge becomes thin and almost white and water is voided more easily, though still with slight itching or smarting. The patient suffers little except inconvenience and the liability to spread the malady, which can be propagated as long as any discharge continues. This is the general course of the affection, but the appearances, duration and violence of gonorrhea are very various. In some cases, the evidences of infection will appear in a few hours after suspicious copulation, while again several days may pass by without any injury resulting from the virus. From the fourth to the seventh day after contagion is the most common period of development. The whole difficulty may subside in a few days, again it may last for weeks and gleet has been known to continue several years. In the young and robust, for the first time affected, the symptoms are usually very acute and the vital force makes a strenuous effort to cast off the poison; and this effort may succeed so well, that the whole difficulty will be terminated in a few days or a fortnight at the furthest. But in those who have previously suffered gonorrheas, and also in the feeble and the aged, the symptoms are less ardent, the progress much slower and the accession of a baffling gleet very probable.

Besides these direct symptoms of gonorrhea, others of a sympathetic character may arise, among which may be mentioned: 1st. Swelling and pain in the lymphatics of the groin, constituting false *bubo*; 2d. Feelings of rheumatism down the thighs, with pain, swelling and tenderness in the knees and ankles; 3d. Irritability of the scrotum, testicles, perineum, anus and kidneys.

It was long supposed that the urethral mucous membrane was more or less ulcerated in gonorrhea, the discharge possessing all the characteristics of that from ulcers, but the examinations of John Hunter proved this not to be the case. The urinary surface is red and swollen and the purulent material oozes out from it; but the virus received in copulation is not sufficient to actually destroy the tissues, and its presence leads only to an arterial excitement and effort of removal, during which serum and molecules are thrown out. Some of these yield to the destructive influence of the virus as soon as they meet it and, by decomposition and catalytic change, become of the same poisonous character as that virus. The excess of serum over the virus dilutes the latter, washes much of it away, weakens its corrosive power and renders it less exciting, when the case sinks into a gleet. The difficulty is mostly confined to the first two inches of the urethra, hence the most severe pain is always felt in the fossa navicularis. But it may advance to the urethral bulb, when much tension and uneasiness will be felt in the perineum, in which situation abscesses sometimes form in consequence, apparently, of absorption of the virus. If the prostate gland is reached, the tenderness at that part will be greatly increased and the urine is likely to be entirely stopped; but this will soon be relieved by the bursting of an abscess, or abscesses, which may form very rapidly in that situation and be discharged into the urethra. The bladder itself may be reached by the virus, when all the pain, burning, vomiting and prostration of acute cystitis will result and life be greatly jeopardized. Such cases are very rare.

As a general rule, the influence of the virus and the inflammatory resistance are confined to the mucous membrane. Occasionally, however, they extend more deeply, when small swellings will occur along the under side of the penis in the course of the urethra. These usually burst externally. Engorgement of the corpus cavernosum is also greater under these circumstances, leading to an almost constant chordee, the penis being very painfully rigid, but curved downward along the urethra. Phymosis is also sometimes connected with gonorrhea.

Diagnosis.—We have already remarked that copulation with a perfectly chaste woman laboring under severe leucorrhea, may lead to an infection in all respects resembling gonorrhea. So, the menstrual fluid of some females, lodging in the rugæ of the vagina, is capable of provoking to violent scalding, chordee, difficult micturation, swelled testicle, &c. Excitants of a different character may also provoke to inflammatory resistance in the urethra, leading to muco-purulent discharge, scalding, &c. 1st. The long continued internal use of guaiacum and cantharides will do this. 2d. Excesses in venery, onanism, the use of wine, stimulating food and similar debilitating habits, have frequently been known to provoke to these discharges. 3d. Fatiguing exercise, gout, rheumatism, the use of bougies, traveling over rough roads, &c., are among the provocatives of similar difficulties, which are called *simple* gonorrhea from the fact of their not resulting from the contact of venereal virus. And here arises the question: Are there any means of distinguishing between the two forms of the difficulty? Many writers have sought to lay down rules by which they might be known from each other, but there are no grounds upon which the practitioner can possibly rest any attempt at such a diagnosis. From whatever cause produced, these urethral discharges closely resemble each other. Their course, their terminations and the accidental complications, are the same, and the most practiced observers can not make any distinctions. Hence, while such discharges arouse our suspicion as to their venereal origin, "if the patient strongly deny that his malady can arise from impure connection," says Druitt, "and his character place his statement above suspicion: if the existence of some one of the foregoing causes can be ascertained, and especially if it be known that he has suffered from it before in like manner, it will be right to pronounce the case *not venereal*, and more especially if the patient be married or be in circumstances which would render any imputation on his continence either disgraceful or ruinous."

But, though we can not discriminate between the virulent and simple origins of these discharges and their attendant symptoms, it is fortunate that, in a remedial point of view, they may all be counted as one. The same management will be called for in all, no matter what may have been the provoking cause. Upon this point all the better Allopathic authors are agreed, this being one among the rare instances in which they have recognized that *the conditions of the parts*, and not the unknown causes of those conditions, are the things to be treated.

TREATMENT OF GONORRHEA.—Here, as elsewhere, it is the duty of the practitioner to render such assistance to the vital force as the nature of the case demands. Lubrication of the urinary passages; washing away the virus by injections and increase of the renal secretions, and loosening the tissues that the blood may have a free passage through all the structures, are the ends to be sought by medication. These done, the evil influences of the virus should soon disappear.

Before proceeding to consider the means and modes by which these ends can be attained, we would caution the young practitioner against a few errors into which he will be strongly tempted to fall by the tone of the current authorities upon these subjects. And first, he should never allow himself to entertain the notion that there is a *specific* treatment for these forms of disease; that there can be found a given set of articles which will cure venereal through some "peculiar" influence exerted upon the poison and the parts affected. Such opinions have no place in medical science. They are purely empirical, and he who fosters them shows a willingness to throw away the positive and content himself with the imaginary and unknown. If venereal is ever cured, it can only be by the application of means which act according to known principles of therapeutics, a knowledge of which is of course supposed to be possessed by those who offer to treat disease. A second error to be avoided, is that of injecting caustics into the urethra; for not only does the very nature of such articles interdict their use, unless for the direct purposes of destruction, but the cures *said* to be effected by them are but a drying of the mucous membrane by a semi-cauterization, in consequence of which the urinary passage is very much injured and the virus driven into the system—perhaps to manifest itself in a more virulent form at some future day.

If the pain is keen, the genitals swollen, the patient feverish and the urine scalding, an infusion of arctium lappa seeds should be drank freely, some ulmus, malva or other demulcent, being used with it; or galium, mentha or any other soothing diuretic, may be used for the same purpose. A lobelia pill, occasionally, will help to soften the undue tension of the system, and the bowels may be kept open by relaxing enemas or the occasional use of leptandra and apocynum in combination. If the orifice is not too tender, urethral enemas of olive oil, gum arabic water or other pure lubricant, may be used every few hours, being always injected slowly, steadily and with very great care. If the patient's stomach is in a foul condition, a thoroughly relaxing emetic should begin the treatment. Chordee and phymosis will be best met by enveloping the whole penis with an elm or mush poultice, sprinkled very thickly with powdered lobelia, the organ at the same time being sustained in a proper sling. Quiet and rest should also be enjoined, as far as possible; for though most patients, particularly the hardened, are inclined to make light of these difficulties, the practitioner must meet acute gonorrhea with a vigorous medication.

If the vital effort at resistance is but slight, or if it has subsided after having been acute, the relaxing means need not be urged so far, but a course adopted which will act more directly upon the urinary organs. For this purpose the balsamic articles are especially applicable. Copaiba has long been a favorite with the profession and is among the best agents of this class, though its taste is very disagreeable.

Venice turpentine is in the same class; solid or white turpentine is also used and balsam of fir is excellent. Whichever article of this list may be selected, it should not be given alone, but combined with some agreeable lubricant, as gum arabic water and oil of sweet almonds. The taste of copaiba may be well disguised by small quantities of mint or wintergreen water. A favorite preparation with us is: expressed juice of galium, one ounce; gum arabic solution, three ounces; balsam copaiba, one ounce; essence of wintergreen sufficient to flavor. Of such a preparation as this the patient may take from forty to fifty drops every third hour, always remembering to keep the bowels soluble by some gentle laxative. Copaiba may also be formed into capsules, or solidified copaiba may be made into pills with sulphate of magnesia and extract of galium and one given every two hours. Balsam of fir (solidified), venice turpentine and powdered eupatorium purpureum, enough to thicken, may also be made into a pill; or the two terebinthinæ may be further diluted with oil of almonds and gum arabic water and given in the form of drops. But upon this matter of combination, the practitioner may exercise his ingenuity to any extent that may please him. Lubricating injections to the urethra should be kept up pretty regularly when the urethra is not too tender; when it is, demulcent drinks should be used freely. The stomach must be maintained in good condition by tonics, as hydrastis and anthemis. If any hardness of the pulse and feverishness arise during this treatment, or exist at the commencement of it, the tonics may be omitted, a lobelia pill given as often as the necessities of the case require and the patient directed to use an infusion of galium, arctium seeds, mentha or asclepias. An alkaline sponge bath should be directed every day and all fats, tobacco and coffee, disallowed.

TREATMENT OF GLEET.—The management of gleet is nearly the same as that directed for gonorrhea. The same balsams must be continued regularly; the system must be well sustained by the stimulating tonics, among which hydrastis stands foremost; the bowels must be kept soluble by apocynum and juglans or similar mild laxatives; and the urethra should be regularly washed out by such gentle astringents as rubus and hamamelis. In a confirmed gleet, the oils of cubebs, juniper and hemlock, in small proportions, may be added to the balsams chosen, and urethral injections made of rhus glabrum bark in ulmus water or other demulcent. It will be well, also, to put the patient upon such stimulating alterants as stillingia, smilax and menispermum. An occasional vapor bath may be employed to great advantage, the urethra having been previously cleansed by free injections of tepid water and oil, that no virus may be present for the absorbents to take up. The clothing should be warm, the genitals alone being kept cool. The bed should be hard and the quilts not too heavy; for there is more or less inclination to spermatorrhea, which will be developed by feathers and heating covers. The diet should be nourishing but free from fats and no narcotics should be allowed. Buchu and uva ursa make useful drinks.

Time and perseverance are required in the treatment of every venereal case, and a strict obedience to the directions should always be enjoined. In acute gonorrhea, success usually attends the above course of management in a few days, though neither practitioner nor patient should be discouraged if a slight gleet ensue in some instances and a few weeks be required for full recovery. When no application is made for treatment till the case is already a confirmed gleet, months may be required for its complete eradication. The cure is then a work of time and the patient should be informed of this at the outset, that he may enter thoroughly and understandingly upon the treatment.

The patient must also be cautioned against resuming hard labor too early after an apparent cure; for a single hour of fatiguing exertion may so weaken the system as to allow the virus to again get the ascendency over the structures, when the discharge will reappear. Let rest and a continuation of the medicines be, therefore, strictly enjoined for several days after the discharge ceases.

TREATMENT OF CHORDEE.—Chordee, though looked upon as a symptom of gonorrhea, requires a few more words of explanation concerning its nature and management. It consists in persistent erection of the penis, the underside being held downward so as to form a curve in the organ, in consequence of which position the pain is very severe. Sometimes it comes on suddenly, lasting but a few minutes and being excited by lewd thoughts, inclination to urinate, &c. These cases are termed *spasmodic*. In other and more numerous cases, the curved erection is almost permanent, when it is dependent upon extravasation of lymph into the cells of the corpus spongiosum urethræ. The lymph coagulates and fastens the cells together, so that this portion of the penis can not distend with the same readiness as the corpora cavernosa. As a consequence, the urethra is bound down and the curvature is much greater than in the other class of cases. It may prove troublesome during the whole of the acute stage of gonorrhea.

Poultices of ulmus and lobelia about the penis are to be mainly relied upon, especially in the cases resulting from lymphy coagulation. They should be applied warm, cover the whole organ and be plentifully sprinkled with inflata. The use of lobelia pills and small rectal enemas of cold infusion of lobelia will complete the relaxation and give relief. Small proportions of gum camphor, combined with any of the medicines used, are of much service. Lupulin has been highly recommended, but is not advisable on account of its narcotic properties. The poultices and pills, if used plentifully, may be relied upon in every case.

In some instances urine is retained in consequence of occlusion of the urethra by the swelling of its mucous membrane. These accidents may become very painful, though not likely to be of lengthy continuance under the active exhibition of the relaxants already advised. When they occur, the lobelia poultices should be extended well down upon the perineum, rectal enemas of lobelia frequently repeated and the warm sitz baths directed. The catheter should not be resorted to till these means have signally failed, and then an elastic instrument of the smallest size should be selected, well oiled and introduced with the utmost gentleness.

Gonorrhea—in Females.

In women, gonorrhea mainly affects the mucous membrane of the vagina, the meatus urinarius being slightly affected. The pain felt is usually about the labiæ, nymphæ and clitoris (which may be extremely sensitive to the touch at all times) and may cause much misery in walking and at every act of micturation. The appearance of the parts is not often changed from the natural color and the practitioner will be greatly, perhaps completely, baffled in his attempts to distinguish it from leucorrhea. On one hand, the acknowledments of the patient and her ability to convey gonorrhea to men, and on the other, the sinking at the stomach, weariness in the limbs and pain in the head and back which belong to fluor albus, may help in distinguishing the two difficulties. Women sometimes have virulent gonorrhea upon the vaginal surface and, from the want of sensitiveness in those parts, may suffer little or no pain. The persistency of the malady is much greater in them than in men, and the discharge is liable to run along the perineum and lead to excoriations at the anus.

The *treatment* is to be conducted upon the same principles as in males, injections (to the vagina) being much relied upon. Demulcents and oils for enemata, when there is an earnest inflammatory effort; and astringents and mild stimulants, when this subsides and gleet exists. Lobelia pills to relax; arctium, galium or mentha, to aid micturation in the first stages; and copaiba, fir and other terebinthinæ, in the latter stages. The utmost cleanliness must be observed around the genitals and the syringe should be used several times a day, warm soap suds being first injected and the medicated enemas afterward. General bathing should be directed and vapor baths may be given when the discharge is gleety and the system well roused by the employment of tonics.

Dry Gonorrhea.

There are rare cases, mainly occurring in the male, where gonorrheal infection is not followed by any discharge—the urethra swelling and becoming exceedingly painful, the urine scalding and every other symptom of regular gonorrhea being present. The virus is more likely to be absorbed in these cases, when graver secondary accidents follow. Relax the patient promptly by both urethral and rectal enemas of lobelia in oil and elm water. Secure a free perspiration by the use of asclepias, salvia or zinziber infusion and, when the discharge has been thus brought on, treat it as ordinary gonorrhea.

Sequences of Gonorrhea.

Several unpleasant local and constitutional difficulties may result from gonorrhea, either from sympathy with the urethral irritation, absorption of the virus or direct contact of the poison with other mucous membranes. Among these the following deserve to be especially mentioned:

Irritation of the Testes, which very rarely affects more than one of these organs at a time. It commonly commences at the epididymus, from whence the whole testicle soon becomes affected, being tender, swollen and painful.

Gonorrheal Conjunctivitis, in which the virus comes in contact with one or both of the eyes, leading to intense pain, profuse discharge and other very unpleasant symptoms.

Impotence and Spermatorrhea.

Cutaneous Eruptions, mostly in the form of roseolæ scattered over the chest and abdomen, usually preceded by slight febrile effort and gradually disappearing of their own a cord.

Stricture of the Urethra, which sometimes becomes ver obstinate.

The more lengthy consideration of such of these affection as can be properly brought within the scope of this work, wil be reserved for the department of disease in different localitie

Syphilis in General.

Syphilis, known also as *Lues Venerea*, comprises all thos forms of disease which follow contagion of the more degenerated venereal virus. These are usually divided into thre general classes: the *primary*, or local, which consists mainl of ulcers (*chancres*) upon the genitals, directly resulting fro the poisonous contact; the *secondary*, or constitutional, consisting of various eruptions and ulcerations upon the body formed in consequence of absorption of the virus; the *tertiar* which is also constitutional, consisting of eruptions and ulcer appearing at a much later date than in the secondary class an proceeding from some elements of the poison uneliminate from the system by the latter. All these forms of venere are of the most troublesome and loathsome character and a always to be considered among the unpropitious surgical acc dents. Their seriousness increases in exact proportion to t extent to which the virus is taken into the system—the te tiary forms of this affection being among the most undermi ing and baffling of human maladies. We will consider eac class separately and in due order.

Primary Syphilis.

The ulcers, or chancres, of primary syphilis are most fr quently seated upon the prepuce, near the angle of the fr num, or in the furrow between the prepuce and the crown the glans. They may be found on the glans itself, on the bod of the penis or even on the scrotum; for all tissues of t body may be corroded by the virus, and it needs but the co tact of the poison with a part (whether that part is abrade or sound) to lead to ulceration, with all the peculiarities the original sore. There are several marked varieties of the sores, depending upon the degeneracy of the inoculating vir and the impurity or wholesomeness of the system at the ti of inoculation. On account of these differences, many write have sought to prove that each variety of ulcer was the product of a distinct virus—an opinion quite contrary to analogy as relates to any other specific poisons and which has been wholly controverted by the observations of Hunter and the experiments of Ricord. The latter gentleman pursued a course of inoculation, taking virus from venereal sores on the genitals and introducing it under the skin in various parts of the body. These direct tests have proven that *all* chancres have characteristic appearances during the period of incubation, and that these appearances are always the same, no matter from what variety of syphilitic sore the poison was taken or how diverse may have been the peculiarities of the ulcers subsequently formed. Upon this point Mr. Erichsen (System of Surgery, p. 409) thus clearly sums up the conclusions now established: "During the first twenty-four hours after the introduction of the specific pus into the skin on the point of a lancet, we find that some inflammation is set up around the puncture, which becomes hot, red and itchy. About the third or fourth day a pointed pustule is produced, which is at first deep set, but becomes on the following day more superficial, with some depression in the center, resembling pretty closely a small-pox pustule; on close examination this will be found not to be a true pustule, but rather a mass of epithelial scales and pus not included in a distinct wall. On the fifth day it has become hard at the base, apparently from the infiltration of plastic matter, and on the sixth it has usually dried, forming a small, round scab and leaving an ulcer which presents the typical characters of a true chancre—being circular and depressed, with a foul, grayish surface which can not be cleansed, sharp-cut edges, a hard base and an angry looking, red areola around it. This is the typical chancre and these are the appearances that every true syphilitic sore on the skin will present about the fifth or sixth day after inoculation; from this time it may diverge more or less completely from these characters, but will yet, if inoculated at any time during the poisonous stage [*i. e.*, while purulent discharge continues], produce an ulcer that will run the specific course up to the same period, after which it may in its turn again deviate into one or other of the special forms that chancres occasionally assume."

These ulcers seldom appear upon the genitals before the fifth or sixth day after impure connection, though, if any excoriation of the organs exists, the virus may develop itself in one or two days. The practitioner rarely sees it in its pustular stage, most patients presenting themselves only after the ulcer has been fairly established. It is seldom that the real nature of the sore will be mistaken, as patients are usually ready to acknowledge the connection with a suspicious person—the venomous character of syphilis being so well known as to make patients desirous of acquainting the physician with the facts in the case at the earliest hour. Whenever any doubts exist, inoculation into the skin of the affected party will settle it, as no other form of virus will reproduce itself with such regularity; but as this mode of test is by no means always desirable, the following points will usually enable the attendant to distinguish between syphilis and some other forms of disease which may affect the genitals.

Simple *abrasion* is of irregular form, always superficial and can never be said to be in an actual state of ulceration. It also appears suddenly, has no pustular forerunner and is seldom accompanied by any inflammatory action.

Herpes is more commonly found upon the skin than elsewhere, though it may occur upon the prepuce and glans. It is known by the appearance of numerous vesicles, which rise suddenly and disappear as unexpectedly without leaving any indurated ulcerous excavations.

Four varieties of chancre or syphilitic ulcers are now commonly recognized as distinctive of the several classes of conditions which may result from infection. These are: 1st. The *simple chancre* or *chancre of excoriation*. 2d. The *indurated* or *Hunterian*. 3d. The *phagedenic*. 4th. The *sloughing*. It is usual for but one of these forms to exist at a time, though it is by no means impossible to find two forms existing together, or to have the simple form degenerate into the more destructive for want of proper care, or the lowest to assume (under good management) many of the characteristics of the milder. Indeed, the ulcers resulting from the introduction of a specific virus obey the laws common to all other ulcerative processes, which have already been fully considered in the chapter upon *Ulceration*.

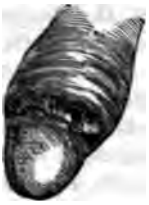
Simple chancre is most common. It generally occurs upon the prepuce, or in the angle formed by the frenum, and consists of one or several shallow sores, which are usually oval or circular, present a tawny-gray surface and are surrounded by a narrow, red areola. These sores present no granules, are tender and itchy and discharge a thin ichor, which is very poisonous. Sometimes they are excessively irritable, again they become almost insensible; they may remain of small size or spread pretty rapidly and even deeply, the dusky-red areola of congestion then surrounding them. If the chancre occurs upon the prepuce, or the fissure between it and the glans, the penis may swell considerably and an edematous phymosis prove troublesome. After the ulcer has thus existed for several days, it is apt to pass into the ordinary class of *weak* sores (p. 161), throwing out pale and flabby granules, which may or may not overtop the surrounding integuments. Or the virus may ravage the integuments as far as its virulence will permit, when the vital force will get the upper hand of it and at once begin to repair the abrasion by the ordinary course of granulation. Or an ordinary granulation may be attempted and fail, the molecules decaying rapidly and the ulcer spreading and retaining its original sensitiveness—the discharge, however, being less purely ichorous than before. This, as well as all the varieties of chancre, is most likely to spread when situated near, or upon, the frenum—through which it is very likely to burrow. The liability to absorption and the appearance of secondary symptoms are also greatest when this is the site of the ulcers. Chancrous destruction of the glans is never fully repaired, the sore always cicatrizing in the form of a depression.

The edges of the simple chancre are not indurated and usually remain on a level with the surrounding surface; but sometimes they degenerate into a sore which has, by some, been classed as a distinct variety. The edges remain non-indurated, but become considerably elevated above the surrounding parts: the destruction is generally rapid and the surface of the sore is of a lightish-brown hue. Chancres of the urethra are generally of this class.

The *indurated* or *Hunterian* chancre is the variety always noticed to follow artificial or experimental inoculation, from which circumstance it has also been termed the *true* syphilitic sore. It belongs to the class of indolent ulcers (p. 165). The edges and base of these chancres are hard, almost semi-cartilaginous—possessing this characteristic from the very outset. The circular form is most common: the excavated surface is of a tawny-brown hue, or an ashy-gray and tenaciously-adhering pellicle may cover it. The discharge is less abundant and more glutinous than in the former class, there is not much sensitiveness, the sore spreads slowly and the process of reparation is feeble and long delayed. The glans penis and the body of the organ are its most frequent sites.

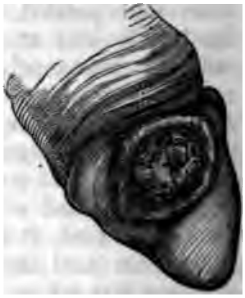
The *phagedenic* form of syphilis is of a very destructive character, being usually rather acute, advancing pretty rapidly along the surface and deeply into the integuments. The aspect of these chancres may be brown or whitish. They are quite irregular in shape, the margin is thin and soft, the pain is mostly trifling, the discharge is profuse and very fetid, and destruction is in the form of small sloughs. There are marked heat and swelling of the genitals, much irritability of the system in nearly all cases and a low form of febrile resistance may be raised—the patient's strength being also prostrated. The sore usually commences at the root of the glans, near the frenum. It often advances deeply into the body of the organ, occasionally forming openings into the urethra, or burrowing under the pubes when situated at that portion of the penis. The whole prepuce and glans may be carried away by the acute form of this class of chancres. When the case is a chronic one, the edges are apt to be indurated, the destruction advances slowly and one part is disposed to granulate as the erosion spreads to a new site. A chancre may be of the phagedenic class from the outset, or it may assume this character in consequence of uncleanness and bad management in any of the foregoing varieties.

FIG. 14.



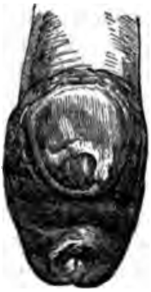
Acute Phagedena; burrowing beneath the integuments of the penis.—ACTON.

FIG. 15.



Chronic Phagedena; surrounding hardness almost equal to true chancre.—ACTON.

FIG. 16.



Sloughing Chancre; the prepuce almost gone: glans going.—ACTON.

The *sloughing* chancre is the most serious form of syphilitic destruction—the virus so far injuring the tissues as to at once lead them into the control of the chemical power. The parts swell immensely and appear of a brownish red, the prepuce is often in a state of persistent phymosis. Decay begins in the form of a black spot, which spreads rapidly over the whole affected part and converts it into a quaggy, blackish green slough. This process of destruction may advance indefinitely, destroying prepuce, glans and the body of the penis itself. We have met with one case, in private practice, where the whole organ had been destroyed to within an inch and a half of the pubes. The constitution feels these sloughings very severely—being always greatly depressed and seeking to make a febrile resistance, which, however, amounts to nothing stronger than a low and irritative fever, without even sufficient power to hold the destruction in more than temporary abeyance. The sloughing may proceed rapidly or slowly, resolving the cases into acute or chronic. When they are acute, the frame suffers so much that death may result in a few weeks; when chronic, they may exist for years without more than undermining the constitution. Fortunately, chancres of this grade are very rare, being seldom met except in those who have the most vitiated bodies and who subject themselves to the lowest and most corrupting grades of alcoholic and sexual intemperance, added, probably, to filthiness of person and semi-starvation. Under such circumstances, it is to be expected that the life power can offer but a feeble resistance to the syphilitic poison, which is left at almost entire liberty to proceed unchecked in its loathsome ravages.

TREATMENT.—The treatment of chancres of syphilis should be both local and constitutional; the local having for its object the removal of the virus and the formation of a granulating surface, the constitutional being intended to aid in those designs at the same time that it is calculated to prevent the general (or secondary) syphilis which follows absorption of the poison.

It is now the common practice (and we quite agree with it) to make an eschar of the inoculated part by the application of a potent caustic. By thus at once and completely destroying the integuments which have been poisoned, the virus will probably be so effectually intercepted that it can neither be absorbed to the injury of the constitution nor reach the living tissues to enlarge the sore by their destruction. But the period to which all such applications should be *positively* limited, is that during which the chancre is forming, or during the first few days, when the syphilitic *pustule* is characteristic of venereal virus and has not yet broken out into an open sore. When the sore is fairly formed, any attempt at removal by caustic is inadmissible, far better modes of management being known. Of the caustics that may be chosen, the potassa fusa is preferable. Let a stick of it be sharpened to a close point and then pushed directly and fearlessly against the pustule for a moment, or till it is evident that the caustic has completely corroded the whole of the parts then occupied by the virus. A gentle stream of cold water should then be directed upon the part and a poultice of ulmus and lobelia applied to expedite the removal of the eschar. When this is effected, a healthy, granulating surface usually appears underneath and merely requires a light ulmus poultice to aid its cicatrization.

If this attempt fails, or if the virus has formed an actual open sore before the practitioner is consulted, caustic applications are not to be made on any account, but a series of soft poultices applied, being medicated to suit the peculiar character of the chancre. These poultices will be found very powerful in absorbing the virus *into themselves*, thereby preventing it from finding its way into the system, and at the same time the agents with which the poultices may be variously medicated will give direct aid to the integuments of the parts, by which they will be better able to vitally resist the encroachments of the poison. We speak upon this matter from what we deem ample experience in all forms of syphilis and in both modes of practice. The basis of all poultices may be very finely powdered ulmus. They should be changed not less than three times a day and the parts should be most carefully washed with a warm suds of castile soap every time; the poultices should be moderately thin, of ample size and warm; the penis should be supported in a sling and quiet positively enjoined upon the patient. These general rules should be scrupulously observed in all cases, in addition to which the local medication may be varied to suit the character of the several classes of cases, as will be presently mentioned.

In the *simple* form of venereal ulcer, no other local application is likely to be needed than the ulmus poultices and other care just mentioned. These will keep up a free discharge, which is well calculated to wash the virus away. If the surface of the sore becomes dry and the want of free corpuscular exudation threatens to give the poison an opportunity to find its way deeply into the system, small proportions of lobelia may be added. If granulations are properly set up and the surface becomes tender and irritable, the sore may be anointed with olive oil, goose oil, olive oil and lime water, or other light lubricant, previous to applying the poultices. If the granules become fungating, some pure astringent may be used, as geranium, quercus, or tanin itself—being either incorporated with the poultices, sprinkled in dry powder upon the surface of the ulcer, or made into a separate wash to be used after cleansing the sore with weak soap suds. Powder of burnt alum may be sprinkled upon the part when the fungus is large, pale and insensitive.

In the cases of *indurated* (Hunterian or indolent) chancre, a more stimulating course must be pursued. We are very partial to filling the excavation of such sores with dry, fine powder of myrica and then applying a soft ulmus poultice over the whole. Myrica may be imitated by mixing minute portions of capsicum with geranium. Quercus and capsicum form a valuable application and any of the stimulating astringents may be used, both in powder and wash, till a lively vital action is obtained in the part and sensitiveness fully restored, when the local management of the simple chancre is to be carried out, with such modifications of relaxing, lubricating or astringing, as the peculiarities of the case may require. When myrica, or geranium and capsicum, will not rouse up sufficient vital action to loosen the tenacious base of an indurated chancre, sanguinaria with myrica, or sanguinaria alone, sprinkled on in fine powder, may be relied upon. It is seldom that more than two such applications will be required; but of this the practitioner must judge from the results wrought in the case before him—continuing the use of such agents till the indurated base begins to yield and then resorting to the above milder means.

When the surface of a chancre becomes decidedly insensible, inclines to a brownish, tawny or greenish hue and appears disposed to spread by sloughs, the poultices must be made stimulating to that degree which will meet the degree of degeneracy. Zinziber and nymphea, mixed with ulmus, may be employed perseveringly in the more mild cases. Asarum, polemonium or leucanthemum, may be used when there is irritability present. In still more gangrenous cases, aristolochia, myrica, capsicum, xanthoxylum and myrrh, may be variously chosen to suit the emergency. Charcoal and yeast may be incorporated with these and ulmus in the truly sloughing chancre; a wash of diluted (or pure) compound tincture of myrrh may be used in addition; and polygonum and arum are serviceable in some cases. Referring to the principles already fully discussed and applied in the chapter upon *Ulceration*, the practitioner will have no difficulty in selecting his means according to the character of the case in hand. Under all circumstances, *perseverance* must be his watchword; for a chancre that has once become established is so very prone to spread, that the attendant does well if he can keep it in check for the next week or two, and the cure is always a somewhat tardy matter. On no account should he be tempted into a use of any of the caustics after the open sore has once been formed; for such a course constantly excites and worries the parts, extends the limits of the ulcer by adding eschar to eschar and always retards recovery. The means we have mentioned have *never* failed in our hands, when persisted in; hence we confidently recommend them to others, believing them to be efficient for any case of chancre that ever will be met.

In the *constitutional* management of syphilis, that which is familiarly known as an *alterative* course of medication is to be vigorously pushed from first to last. The patient being confined within doors, decoctions of such articles as smilax, rumex, artium (root or seeds), stillingia and alnus, are to be given freely. Decoctions are preferable to sirups, as they act more promptly and it is important to procure the full detergent action of those articles as early and fully as possible. The decoctions should be moderately strong and pushed to the point of moderate diaphoresis and diuresis, the bowels being regularly unloaded by enemata and the liver gently moved by appropriate potions of euonymus or leptandra. A daily course of warm alkaline baths should be directed, and the stimulating vapor bath may be used provided that no buboes have formed. If the pulse becomes feeble and the patient is disposed to sink into a typhoid condition, with an unsteady febrile attempt at resistance, teas of zinziber, polemonium, eupatorium and similar agents, should be used freely, any evident foulness of the stomach relieved by a thorough emetic and such other means employed as have already been fully directed on pages 67–71. In addition to these things, quiet must always be enjoined upon the patient, diet must be limited to the lighter articles which contain little oleaginous material, tobacco and coffee must be scrupulously forbidden and the utmost cleanliness positively insisted upon. This course must be carried out *vigorously* to the end.

The uninitiated may think that this is more treatment than such a little local matter will demand; but when they place before them the horrors of secondary syphilis, they will more readily understand that no judicious method of management can possibly be pushed too far. The sores may be readily healed, perhaps even without the aid of a systemic purification; though a proper acquaintance with the intimate relations existing between a part of the body and the whole, will show how much can be gained for the ulcers themselves by the employment of constitutional medication. But absorption of the virus into the system is what is to be so greatly dreaded; and to resist this the practitioner must bring to bear every means within his command. Throwing aside, *in toto*, the murderous folly of mercurializing syphilitic patients, and depending upon the potent means just directed, there will be few cases in which even bubo will follow, much less the horrors of a general contamination. But, to be thus successful, the practitioner must make his constitutional treatment go hand in hand with his local applications, commencing with both *from the very outset* and pushing them with a thoroughness and watchfulness which will not allow the poison the least opportunity to advance. We have seen numerous cases of secondary syphilis result under the care of those who have attempted the course we recommend, and merely, as we believe, because they delayed their alterative medication till the virus had found its way into the system, and then used it with a too timid hand. In our own practice, we have never had but one case of secondary accidents follow in a person for the first time inoculated with a chancre, and only slight bubo has ever occurred in any person treated by us in this way. We attribute our success entirely to the sanative power of the means employed and the vigor with which we have pushed them from first to last. It is not likely that the after accidents can be always thus completely warded off by these means; but our success, and the success of others, is sufficient to beget confidence in them. We have treated not less than three hundred cases of syphilis, full eighteen of which were sloughing phagedena, and we venture that no other mode of practice has ever been equally potent in averting secondary symptoms. We do not speak these things in self laudation, but simply to show the value of the course we have recommended and, if possible, to make an irruption into that destructive system of cauterization and salivation which has been so long looked upon as the *only* mode of managing syphilis.

Consecutive Symptoms of Primary Syphilis.

Primary syphilis is frequently followed by a variety of local affections, which, though they come after the venereal ulcers and might, therefore, be literally termed *secondary* accidents, yet do not belong to that constitutional class of affections to which this term has been given. They may, on this account, be conveniently considered under the head of *Consecutive Symptoms*. They consist of *Bubo*, *Warts*, *Indurated Cicatrices* and *Condylomata*.

1. *Bubo*.—This term is applied to syphilitic abscess of the lymphatic glands, especially those of the inguinal region, though the ganglia of the dorsum penis may be similarly affected. Usually but one gland at a time is affected and causes a plain, elliptical swelling in the groin, above Poupart's ligament, mostly unaccompanied by any particular redness till pus begins to accumulate. Sometimes, however, both inguinal regions are thus affected: the swellings are also sometimes irregularly scattered among several glands, and a faint red streak may be traced from the chancre on the penis to the bubo, which is also red from the commencement and before fluctuation proves the presence of pus.

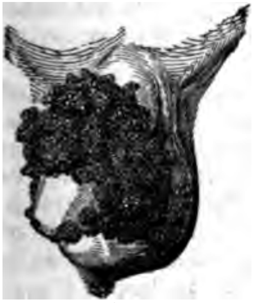
Buboes commence with a slight pain and tenderness, sooner or later followed by moderate swelling, which is noticed only upon pressure. They pursue their course more or less rapidly and are, like other abscesses, divisible into acute and chronic buboes. They are the direct sequence of syphilitic absorption—the virus, on its passage toward the body, being temporarily stopped at the ganglion. Swellings (not abscesses) of these parts are sometimes sympathetically connected with a virulent gonorrhea and there are a few well founded instances on record where true bubo seemed to have resulted from direct absorption of the virus received during connection, without any intermediate appearance of chancre. Most real buboes appear as ulceration of the chancre diminishes, though they may, in very degenerate cases, be formed at an earlier day. The quality of the inguinal enlargement partakes very much of the character of the producing chancre. Thus, a *simple* venereal ulcer generally leads to bubo promptly and this bursts soon and is readily disposed to heal. An *indurated* chancre gives rise to an indurated bubo, which may remain of almost stone-like hardness for weeks after the sore itself has been healed, then burst leisurely and leave an intractable indolent ulcer for management. The *sloughing* and *phagedenic* forms of chancre foster the most degenerate buboes, which usually advance rapidly to a large size and manifest a very strong tendency to spread, both deeply and superficially, after they burst. Buboes of this kind have been found spreading over the ilium, upon the abdomen and along the thigh, healing by one edge nearly as rapidly as they advanced by the other. At other times they have burrowed deeply, causing death by severance of the femoral blood vessels.

All inguinal swellings, even all inguinal abscesses, do not proceed from absorption of syphilitic virus. Some of them arise from scrofula; and tenderness, with enlargement, may follow from irritation of the feet or from non-venereal irritation of the genitals. We knew of one case where induration and purulent discharge proceeded from wearing pants that were entirely too tight in the thighs, no venereal inoculation having ever existed. The continued use of mercurials has also been known to lead to most hideous inguinal abscesses. There are no means of distinguishing venereal from other forms of bubo, unless either the patient admits the previous existence of syphilis or the discharge from the abscess is inserted into some other part of his body with a design to test its ability to reproduce itself specifically.

It is proper to mention, at this point, that, while buboes almost invariably follow primary syphilis, cases are recorded in which they have not appeared till secondary sypiylis had been established. But these instances are rare and anomalous.

TREATMENT OF BUBO.—The treatment of bubo is to be conducted on precisely the same principles as those directed for abscesses from any other cause. Every effort must be made to prevent the absorption of the virus; for the danger of constitutional inoculation is much greater then than it was before. The thorough course of medication already advised for primary syphilis, will usually accomplish this object; but if it fails, or if the practitioner is not consulted till the swelling of the glands has commenced, measures must be taken to prevent the threatened destruction of tissue. For this purpose the practitioner should poultice the parts freely with ulmus, lobelia and aralia, give a relaxing vapor bath daily and sustain a free cutaneous action by such drinks as zinziber, aristolochia and seeds of arctium lappa. If these means fail and pus is detected, cease the vapor baths *immediately*, else the accumulated poison will be invited through the system. Open the abscess at the earliest hour by a sharp curved bistoury and make the incision the full length of the purulent cavity. Having obtained the discharge of all the pus, syringe the cavity freely with a weak infusion of zinziber or diluted compound tincture of myrrh; renew the daily vapor baths and sustain the strength by such tonics as hydrastis and anthemis. The cavity itself may then be managed according to the principles for treating ulcers. If it is a simple sore, cleanse it frequently with *weak* suds; use zinziber, polemonium or hydrastis, in a wash, if it shows a degenerating tendency; prefer geranium, quercus or myrica, if it becomes senseless and fungating, and employ capsicum, xanthoxylum and myrrh, if it inclines to gangrene or phagedena. If the edges are disposed to slough, cut them off early and as far as possible without injuring the blood vessels; if they tend to roll inward and unite, insert a piece of oiled lint to hold them apart and labor to have the gap heal from the bottom.

FIG. 17.



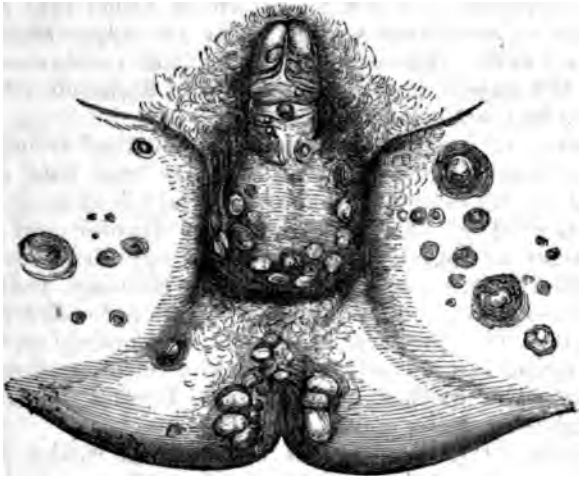
Warts.

Warts.—Venereal warts may follow gonorrhea as well as syphilis, though they most commonly occur as sequences of the latter. Their usual site is upon the mucous surface of the prepuce or in the furrow between that and the glans penis. They consist of bunches of mulberry-looking projections, are generally of a bright color and vascular, but are sometimes horny-looking, pale and insensible. They are not often very sensitive, though they are, occasionally, exceedingly tender. They grow to various sizes and in every imaginable shape; are always accompanied by more or less phymosis, and sometimes so retard the circulation in the prepuce as to lead to ulceration, when the warts will be seen through the opening. They may be readily removed by a pair of keen-edged scissors, their bases being afterward touched by a stick of lunar caustic. An occasional application of oil will keep the parts soft and little trouble need be apprehended. The tendency to phymosis should lead the surgeon to give venereal warts his early attention, else the prepuce may be drawn so firmly over them that he may be forced to the unpleasant alternative of splitting it up in order to reach the warts and remove them.

Indurated Cicatrices.—These consist of an unwholesome covering formed over a chancre at a period when its virus has been but partially removed. The cicatrix forms properly at first, but, after some weeks or months, gradually enlarges, presents a pewter-colored surface and feels very hard. No apparent inflammatory action is present, but the cicatrix goes on increasing till it forms an indurated lump which may be of any size between a pea and hickory nut. No pain is felt and no inconvenience or evil apprehended by the patient, who is usually tardy in consulting his medical adviser. But it is found that these cicatrices possess all the virulence of an open sore—the virus appearing to keep its seat within them, fermenting, multiplying and ultimately breaking into deep sloughing chancres and poisoning the whole system. In *treating* these indurations, the end to be attained is an elimination of the virus *without abrading the surface of the cicatrix.* This can be best done by thorough and stimulating vapor baths, stimulating alteratives internally and tonics in sufficient quantity to sustain the system. The diet and habits should be carefully guarded, with an eye to the quiet and purification of the patient. The indurations may be untouched or gently smeared with olive oil occasionally. If they break out into open sores, they must be managed according to the character of the ulcer. Time and patience will be required in removing these cicatrices.

Condylomata.—These are various kinds of excrescences of the integuments and are generally formed about the anus, along the thighs and upon the scrotum and labiæ. At times they are white, again reddish; dry, discharging; painful or perfectly insensible. They are soft and fungous to the touch, look like rounded buttons, are covered with a thin pellicle of mucous-looking cuticle and the discharge that occasionally comes from them is very fetid. There may be but a few or there may be very many of them, and they usually appear after the chancres have begun to heal over, though they may be found while ulceration is progressing rapidly. It is quite common to find them occurring in connection with the ulcerated throat and cutaneous eruptions of secondary syphilis, from which circumstance they are often enumerated among venereal accidents that have a constitutional origin. They are

FIG. 18.



Condylomata.

to be treated, locally, as if they were so many small ulcers, the character of the applications depending upon the condition of the sores. When they occur in connection with constitutional symptoms, the general management of secondary syphilis will answer for them both, the topical applications to the condylomata being continued.

Secondary Syphilis.

Secondary syphilis includes all that class of affections which follows primary syphilis in consequence of absorption of the poison of the latter. The existence of a chancre is always necessary to the production of the secondary symptoms, and, if a bubo has also existed, the probability of an extensive constitutional affection is greatly increased. These secondary evils are mainly found upon the skin and mucous membranes: the throat, tonsils, eyes, nose and testes, are favorite seats. The soft bones are also frequently injured in the same way, though these are considered as being most apt to occur in the tertiary class of accidents. A few of the cutaneous affections belong also to the tertiary group.

Secondary syphilis usually manifests itself in from six to twelve weeks after the occurrence of chancre, though occasionally it may be delayed some months. In cases of very acute and destructive chancres, the secondary affections may appear while the ulcer is in progress. These affections are usually preceded by a low febrile effort, which may last several days, or even some weeks, before the appearance of the secondary evils. The urgency of the vital resistance usually marks the extent and virulence of the accidents which are about to be manifested.

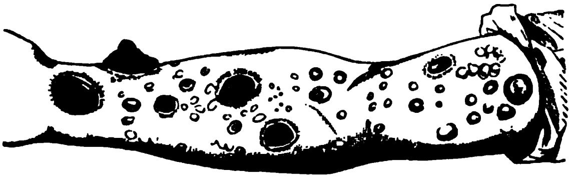
No form of constitutional syphilis, whether secondary or tertiary, is contagious—a point that has been long disputed and is even yet doubted by many, but which is most conclusively proved by the observations of Hunter and Ricord. No danger of contamination need be apprehended—except that either of the parents may, while laboring under these forms of syphilis, convey the same affection to offspring then begetting. This propagation of disease is mainly on the part of the father and is conveyed from him to the mother during gestation—the mother being almost beyond impregnation when laboring under constitutional venereal.

Secondary syphilis may continue several weeks, as many months or even some years. But it more commonly disappears within a year; and, if the whole of the virus should not have been then ejected from the system, the tertiary class of symptoms follows. The Hunterian and phagedenic classes of chancres and buboes are most frequently the propagators of secondary accidents, though the simplest chancres may give rise to the same evils. Persons of unhealthy systems, enfeebled constitutions and uncleanly habits, are most liable to the severest consequences of venereal absorption. Fortunately, however, these secondary affections do not, and need not, always result, even from the severest forms of primary sore. If the above management of chancres has been carried out with the thoroughness and energy advised, it will not be often that the practitioner will witness these constitutional injuries. It can not be doubted that the use of mercurials, which has been so almost universally advised in venereal complaints, has been the greatest occasion of multiplying these loathsome maladies. Under a more rational and sanative medication, the horrors and disgraces of secondary contamination bid fair to be lessened by at least two-thirds.

A person laboring under constitutional syphilis becomes thin and emaciated, the appetite fails, the secretions are usually very irregular, the joints are painful and the patient complains of an overpowering sense of feebleness. The breath of these patients is of a peculiar fetor, and is especially repulsive if they have been subjected to a mercurial course or have ulcerations within the mouth. A foul odor is also constantly exhaled from the skin. The eyes have a dull expression and the patient soon becomes of a palish blue color, with a half cadaverous expression that is most noticeable in old cases or in those where the symptoms are of the tertiary class.

The cutaneous eruptions of secondary syphilis assume various forms, apparently depending upon the simpleness or degeneracy of the chancre from which they came. 1st. The *roseolar* form (appearing mainly upon the abdomen, following the simple chancre and often arising before the primary sore is healed) consists of brownish red or copper-colored blotches. 2d. The *scaly*, which seems to be more like an aggravated type of the former than a distinct variety. The blotches are more numerous and copper colored and are covered with thin scales of cuticle, which ultimately peel off and leave shallow, copper-edged ulcers. In rare cases, the cuticle has a smooth and shining appearance. These blotches occur in the groins and axillæ, on the penis, scrotum, lips, feet and glans. 3d. The *pustular*, which is a very common variety. This begins "as small, hard papulæ of a coppery hue, slowly softening in the center into a small, deep seated pustule, having a large, brown or coppery areola and forming speedily large, circular, dark brown, or even black, scabs; usually flat and irregularly crusted, at other times conical. When flat, they constitute syphilitic ecthyma; when conical, the rupial form of the disease. After their separation, troublesome ulcers of a circular shape and rather a foul surface, are commonly left" (Erichsen, p. 428). Druitt prefers to consider *rupia* a distinct eruption, consisting in "large, flattened bullæ, filled with serum, which gradually become purulent and finally dry into scabs, under which the skin is ulcerated" (Surgery, p. 199). 4th. Syphilitic *boils* often occur and are of the indolent cast, painful and have an ichorous discharge. It is peculiar of all these eruptions that they have a coppery

FIG. 19.



Rupia.

tinge—sometimes slight, often confined to the edges and areolæ, yet distinct and unmistakable.

The mucous membranal affections of secondary syphilis are of several varieties, but as they almost invariably involve the subjacent structures, the forms of disease peculiar to both tissues may be considered in connection. 1st. *Vegetations*, both in the form of warts and condylomata, about the anus, perineum and scrotum, are very common. In the female, they occur upon the labiæ and are occasionally found, in both sexes, upon the lip, tongue and palate. They resemble the vegetations already mentioned, and from which they can not well be distinguished except by the fact of their dependence upon constitutional infection. 2d. *Eruptions*, in most respects similar to those peculiar to the skin, may occur in the nose and larynx, on the lips, tongue, prepuce, labiæ, &c. It is in these positions that ulceration extends to the lower strata of integuments and proves extremely offensive and troublesome. The difficulties in the *throat* are, perhaps, most frequently met with, beginning early and continuing late. The fauces, the palate and the pharynx, may be studded with a red efflorescence, with pustulæ and with the various forms of ulceration which characterized the original chancres. The *larynx* may become similarly affected at the same time, and will cause huskiness of voice and a most troublesome cough, with fetid expectoration. There is always a difficulty of swallowing, great prostration of strength and an irritable condition, in these cases. The phagedenic and sloughing forms of ulceration occasionally commit unsightly ravages in the pharynx and along the fauces, and death may result from edema glottidis when the larynx is much affected. When the *lips* are affected, they crack into irregular gaps and discharge a thin and fetid ichor. The *tongue* and *nose* are seldom seriously troubled with secondary symptoms, these being more commonly the seats of tertiary accidents, for which division we will reserve some further remarks in relation to those localities.

TREATMENT.—When the syphilitic virus has once fairly found its way into the system, its removal is a matter of the greatest difficulty and will require all the means, energy and patience, that the practitioner can command. Prostrating the energies of the body and depressing every fiber and tissue, it proves one of the most baffling forms of disease that is likely to fall into the surgeon's hand, and he is indeed fortunate if he can succeed at all in freeing the body from the effects of the loathsome poison.

The chief dependence is here to be placed upon the use of constitutional measures and every effort must be made to open, and keep open, all the emunctories of the system and rouse the organs to free action, with a view of enabling them to cast the virus out. Prominent among these measures is to be placed a course of vapor baths. Warm bathing is excellent, wet sheet packs are advantageous, but no mode of using water can be at all compared to that of thorough and stimulating vapor. We advise their use daily, or every second day, as may be deemed best—sarsaparilla and ginger being used freely while the patient is in the bath.

The alterative class of remedial agents must be used constantly and those of the stimulating kind are preferable. Smilax, stillingia, rumex, arctium, celastrus and guaiacum, are the articles mainly relied upon and they should be combined with capsicum, mezereon, euonymus or eupatorium purpureum, accordingly as more stimulants, hepatics or diuretics, are required. Smilax, celastrus and guaiacum with euonymus in small proportions, form an excellent preparation and has done more service in our hands than any other articles we have combined, though the permanent diuretics are likely to be much needed. On the subject of combination, however, the practitioner is left to follow the bent of his own inclination, putting together any of the stronger alterant agents that may best suit his purpose, inclination or experience. The form of sirup is the best in which to administer these agents in secondary syphilis, as more time is allowed and more internal, searching influence demanded, than in primary forms of these affections. Large quantities should always be given, in view of which it is well to make the preparation as palatable as possible. A half pint of strong sirup a day may not be at all too much.

The use of occasional emetics is an important adjunct when the tongue becomes foul, the appetite fails and the patient is disposed to have headache. Feebleness and foulness of the stomach are very common conditions and that organ may require much attention. When the larynx is affected, the difficulty of swallowing is so great as to frequently render it impracticable to drink enough teas to secure free emesis, under which circumstances the tonics and gentle stimulants to the liver must be used instead and the diet carefully regulated. Or the emetics may be, in part, administered *per anum.*

By the faithful and continued use of these constitutional measures, the virus may be ultimately eradicated and the patient enjoy comfortable health again; but a person who has once been afflicted with secondary syphilis never fully recovers from it and is always liable to suffer from the slightest accident. In addition to constitutional treatment, however, local applications may be made with great benefit. Thus, in the various forms of eruption, the patient may be washed all over with a strong decoction of hydrastis, impatiens hastata, cimicifuga and myrica, nymphea and zinziber, or any other gently stimulating and cleansing articles that may be suitable in other degenerate ulcers—for the same laws of treatment obtain here as in ulcers in general. These washes should be applied immediately after the vapor baths, besides which they may be used two or three times a day, if deemed necessary. Powdered hydrastis, zinziber, aristolochia or capsicum, may be sprinkled upon the largest and worst sores and allowed to remain for a few minutes before being washed off—the degree of stimulus being proportioned to the degree of degeneracy. If the sores are irritable, hydrastis or impatiens are among the best washes and some soothing application, as ointment of celastrus or sambucus, may be afterward used upon the larger ulcers. When the fauces and pharynx are affected, gargles of similar articles may be used very freely and a fine, dry powder of such of them as are most applicable to the form of ulceration, may be blown in once, twice or thrice a day. When the difficulty is in the larynx and direct applications are impossible, stimulating washes may be applied externally and drops of lobelia, capsicum and myrrh, taken in small quantities every half hour or hour. If the air passages become irritable, the stimulants must be dropped and cimicifuga or other relaxants used. Pills of copaiba are also of very great service. Warts and condylomata are to be treated as was directed in primary syphilis; fissures of the lips may be managed in the same way as the ulcers of other parts.

Tertiary Syphilis.

Tertiary syphilis is a continuation of the constitutional affection, appears at a still more remote period than the secondary accidents and is due to the non-elimination of all the virus of the latter class of sores. It is seldom that the accidents of this class follow any but the phagedenic and lowest forms of Hunterian chancre and then only in persons of filthy habits and broken down frames, or in those who have been largely subjected to mercurialization during the primary and secondary stages. They are not likely to appear till many months, or even years, after the chancres, are not contagious, may be transmitted from parent to offspring and, in many other respects, show their relation to the class of secondary accidents. The bones and mucous membranes are mainly affected by tertiary symptoms; and when the constitution has once suffered from the infection of this degree, eradication of the virus is almost one of the impossibilities—death sooner or later relieving the sufferer from the burden of his loathsome disease.

Among the bones, the turbinated, the cranial and those of the extremities, are peculiarly liable to destruction in the form of both *caries and necrosis.* The characters of the osseous ulcers are of various kinds, sometimes proceeding very rapidly and at other times slowly; now burrowing through the whole osseous structure, laying bare the brain, breaking down the integrity of the antrum and committing the most fearful ravages, again simply creeping along an outer tablet and involving the covering in a common destruction. *Nodes,* or hardened, conical enlargements, also occur, especially upon the more superficial bony surfaces, as the tibia and cranium. They are generally indolent, occasionally tender and nearly always racked with the most excruciating pains *at night.* Occasionally these nodes become soft and appear to be filled with fluid; but the surgeon should never allow himself to be tempted to puncture them. The *hair* frequently becomes diseased and falls off and a degenerate onyxia may trouble the nails. Syphilitic *tubercles* are common to the tertiary stage. They consist of smooth, flat elevations, generally situated upon the face, penis and extremities, but may also appear upon the tongue and uterus; they are generally of a heavy purple color, hard to the touch and run into deep foul ulcers that intractably extend over a large surface. (Direct tertiary ulcers may also form upon various parts of the body without the previous existence of any tubercles or boils). The eye is a frequent point of tertiary manifestations, the iris becoming contaminated with the poison, to resist which inflammation will be established. Ulcers will be formed upon the failure of this vital attempt and the whole organ may be destroyed, the orbital bones partaking in the ulceration.

TREATMENT.—The management of tertiary syphilis is to be mainly of the same constitutional character as that directed for the secondary accidents. Stimulating vapor baths and alterants and tonics, and emetics when indicated, are altogether the best means to cleanse the system of the virus, if cleansed it can be. Ulceration of the bones or soft structures are to be managed according to the general principles directed for ulcers; and as tertiary symptoms are always of a degenerate character, the stimulating and astringing appliances will be largely called for. If the nodes are tender, the soothing and relaxing means are to be used; if hard and indolent, the more stimulating agents must be added to the relaxants. The success attending any treatment is not at all flattering, alleviation and temporary comfort being all that can usually be hoped for; and even these can be secured only by a most energetic course of baths and local and constitutional management.

Syphilis—in Females.

Syphilis in the female is in all respects similar to that in the male, the primary sores being of the same general characters and the secondary and tertiary accidents pursuing the same courses. The chancres may be situated upon the nymphæ, upon the walls of the vagina at any point or upon the uterine organ. Their appearance and progress are the same as in the sores upon the penis. From their unhandy situation, they are difficult to manage, are usually very persistent, though not likely to attain to considerable size and the constitutional inoculation is always liable to be very great. Women usually suffer greatly from condylomata and from huge warty excrescences upon the labiæ and nymphæ; an almost complete amputation of the nymphæ sometimes becomes necessary in order to relieve the parts from disease.

The treatment of females is to be conducted upon the same principles as that for males; but as no poultices are applicable, the use of vaginal injections is to be mainly depended upon. These clysters should be employed very frequently and thoroughly, being medicated with those articles which are appropriate to the character of the sores. Besides this, the proper agents may be introduced to the ulcers in the form of fine powder, such applications being made directly after each medicated injection. Cleanliness is an item of paramount importance and the use of water, or weak warm suds, several times a day, should not be neglected. The constitutional treatment should be in all respects the same as that already directed.

Syphilis—in Children.

The fetus in utero may be inoculated with the syphilitic virus, either by the father or by the mother. The form is always that of secondary syphilis, which is usually very much aggravated beyond its ordinary characters. The child is born with some form of the constitutional eruptions existing, as may be at once known by a "universal desquamation of the cuticle, a hoarse, squeaking voice, copper colored blotches, a scaly eruption upon the chin and an unnatural redness of the anus" (Hey, as referred to by B. Cooper). Children thus affected are always feeble and their chances for life are not very good; yet a carefully conducted system of hygiene, aided by a proportional degree of constitutional medication, may ultimately rid the system of the virus and secure a comfortable degree of health.

In treating children affected with syphilis, great attention is to be directed toward the skin, for this is the principle channel through which the virus should be eliminated. Vapor baths cannot be given during the infantile life of the child, but their place can be measurably filled by the daily use of the tepid sponge bath and a regular exhibition of such diaphoretics as arctium seeds with aristolochia, asclepias and hedeoma and similar combinations of those relaxing and stimulating agents that influence the skin. Tepid wet sheet packs are not advisable; for the time required to give such a bath will exhaust the already feeble patient and leave it in what may be aptly likened to an anæmic condition—the skin being pale, flabby and cold, and the pulse feeble and compressible. In order to escape this same condition upon the use of the sponge baths, friction must be applied after the bathing and the child should be, at all times, warmly clad.

In exhibiting the alterants to children, the relative vigor of an infant to an adult must be borne in mind and the dose varied accordingly. Yet these agents must be pushed very thoroughly. But few stimulants are needed in the sirups and the relaxing alterants are generally best; for syphilitic children are usually very irritable and are not unfrequently troubled with febrile manifestations of the irritative form, when they will require plenty of relaxants rather than more excitants. It is sometimes astonishing to notice the amount of lobelia that will be required to allay excitement in these cases and the system seems to be strung up to a state of extreme tension which it is almost impossible for the practitioner to relieve. Yet he must labor with assiduity to accomplish this object, for it is not only necessary to the comfort of the child, but is decidedly essential to the eradication of the malady—as no virus can be cast out of the system while the tissues are contracted and the emunctories closed.

If the skin becomes pale and the lips red upon their inner surfaces, injections of lobelia and elm must be given—the clysters being made small, that they may, if possible, be retained. Small doses of myrrh and lobelia may also be exhibited three or four times a day while this condition con-

tinues and no form of bathing is then advisable. Sen
ness of the brain may be relieved by lobelia and light fr
upon the head with the hand. Great tenderness must l
served in handling these children, for their extreme feeb
renders them subject to exhaustion upon even ordinary
ing about. Their habits should be so regulated that
of sleep may be enjoyed by them.

PART III.

ACCIDENTS AND INJURIES.

CHAPTER I.

GENERAL RESULTS OF VIOLENCE.

Shock of Injury.

THE term, shock of injury, is used to designate that deep depression of the nervous, circulatory and respiratory functions which may follow any injury or extensive operation. Burns, scalds, compound fractures, lacerations, severe wounds, amputations and similar influences, are among the more common causes of that form of shock which will come under the notice of the surgeon. In medical practice, however, we meet with collapse following large doses of opium, tobacco, arsenic, sulphuric acid or any other poison, and excesses in mental emotions may also cause peculiar nervous prostration.

The nearer that the injured organ is to the vital centers, the more serious will be the result of the violence. Thus, blows upon the stomach, brain or spinal column, may cause almost instantaneous death, and wounds and contusions of the knee, hip and other joints, generally produce very serious prostration. The state of the system and the temperament and age of the patient, always have a modifying influence upon the extent of the shock—the feeble, the aged and the extremely nervous, suffering more intensely than the healthy, the motive and the middle aged. Hence the *extent* of an injury, although it generally measures the degree of danger, is not a reliable evidence of the extent and character of the symptoms that will follow it: severe laceration at one point will lead to speedy dissolution, while the same degree of violence at another point will cause nothing more than syncope, and the operation that will scarcely fatigue a strong patient, will cause an alarming prostration in one who is more feeble. The degree to which the injury is felt and the character of the symptoms manifested, have led surgeons to divide the shock into four classes—partial, universal, overwhelming and insiduous.

Partial Shock.—A shock is understood to be *partial,* when the whole system does not suffer from the local injury. Thus, muscular power may be transiently impaired by a blow and there be no evidence of impaired sensation; or sensation may be depressed, yet the muscular power remain normal. More frequently, however, there is absence of both sensation and motion, the part refusing to act under the direction of the will.

TREATMENT.—Stimulating embrocations, with friction and electricity, to the part, and asarum, zinziber or aristolochia, internally, will generally be found sufficient to restore the functions.

Universal Shock.—In this degree of nervous prostration the symptoms vary extremely. The shock has been felt throughout the system, in some cases producing simple paleness, languor and slight rigors, with a sense of coldness, hurried respiration and an anxious expression of countenance. In graver cases, however, the patient lies in a half unconscious state and speaks incoherently when questioned. The pulse is small, rapid, tremulous and irregular; respiration is performed imperfectly and with sighing, and the surface is pale and cold, with slight shivering. If the symptoms are still more severe, it is distinguished as the overwhelming shock.

Overwhelming Shock.—In this case the nervous and sanguiferous systems are completely prostrated. The usual symptoms are, low moaning or sighing respiration; pulse indistinct or entirely absent; cadaverous countenance; involuntary discharge of feces and urine, in consequence of paralysis of the sphincters; surface flabby, cold and clammy; eyes rolled inward and upward and the upper lids partially closed. There is also protracted syncope. This form of shock is generally the result of violence and lesion of some of the vital organs. In many instances, however, extreme violence inflicted on parts remote from the vital centers, will produce overwhelming shock. The passage of heavy bodies over the extremities, burns and scalds extending over a considerable surface, gun-shot wounds, &c., may be mentioned among these cases.

REACTION.—In vigorous constitutions, the vital power will, in a shorter or longer period after the reception of an injury, attempt the restoration of harmonious action in the system. Rigors, vomiting and return of the capillary circulation and sensibility at the surface, are the evidences of this attempt, which is termed reaction and may occur spontaneously or be induced by remedial measures. As a general rule, the greater the agitation in the system after injury the more readily can reaction be induced. The comparative mildness of the symptoms is no guarantee of the absence of danger, for this very appearance is, in some cases, an evidence of want of reactive power. The symptoms may be slight in consequence of trivial injury or strong resisting capacity; yet the surgeon should not be too hasty in his conclusions nor in the withdrawal of his means. However trivial an injury may be, it may terminate seriously from overwhelming prostration of the nervous system, as in the case related, by Sir A. Cooper, of a young lady who merely pricked her finger with a sewing needle, when she immediately "screamed, fainted and died," from the shock produced.

If previous disease has existed, or if lesion of some important organ is present, reaction may never be perfectly established, but a low, irritative form of fever may be manifested. If reaction is partial, we have cause to fear that the system will again relapse or suffer what may be termed secondary shock, from which it will, probably, never recover. In those of intemperate habits, reaction will be tardy and imperfect.

Mental shock (more properly mental depression in consequence of corporeal shock) may follow all severe injuries. Although transient, this depression is very great while it lasts. It is frequently present in gunshot wounds, under circumstances where the individual is possessed with the idea of instant death. In operations after mechanical injuries its existence is of practical importance. If the patient has entirely recovered from the real shock, and rigors and a pale and cold surface return as the operation is about to be performed, and confidential words of assurance and appropriate stimuli do not cause prompt reaction, the operation should be postponed.

PROGNOSIS.—If lesion of the brain exists to any great extent, the patient may die of compression produced by extravasation of blood. The absence of spasm and pain, when we should reasonably expect them to occur, begets fear lest the system should not be able to resent the injury. Hemorrhage must ever be regarded as an extremely dangerous complication. Singultus, of a loud, protracted and unremitting character, when occurring at a late period, is evidence of a fatal termination, as an absolute exhaustion of all nervous energy has then ensued, which no stimulation can ever arouse.

TREATMENT.—Universal and overwhelming shock are to be treated by the same means, which need differ only in the extent to which they are applied. Place the patient in the recumbent position; administer warm, diffusible stimulants; apply warmth and moisture to the surface till an equilibrium is produced and then maintain that condition. If vomiting or distressing nausea continues, a weak infusion of mentha viridis, given in small quantities, will soon allay it, unless crude and undigested materials are the cause, when an emetic should be administered at once. The surgeon should always ascertain, if possible, whether a full meal has been taken shortly before the injury, and, if so, he should rid the stomach of the ingesta without delay. If the patient is unconscious and unable to swallow, enemas of third preparation of lobelia, friction with acetic tincture of capsicum, hot foot baths and warmth to the surface, are to be relied upon. Every means in our power must be used to bring about reaction. This condition may last for several hours, but we should not desist in our endeavors, either till they are successful or the patient dies.

When reaction has been established, attention must be directed to the urinary apparatus, particularly to the bladder, as this organ may be distended with urine and need emptying. As soon as retention is discovered (and this will be ascertained by the swelling above the pubes and an examination per rectum), catheterism should be resorted to, unless it yields promptly to medication. A still more serious renal difficulty may exist in the form of *suppression* of urine. The patient should have our most anxious solicitude, till the secretion is restored; and to this end our best stimulating and relaxing diuretics (arctium lappa seeds, juniper, cubebs, eupatorium purpureum, &c.) should be administered. Stimulants and friction to the lumbar regions may be also employed.

Insidious Shock.—This form of shock is of peculiar interest to the surgeon, on account of the anomalous symptoms it presents. The patient does not complain of any pain and is even unwilling to have a surgeon wait upon him or dress his wounds; and the inexperienced practitioner might, from the apparent comfort of the patient, give a favorable prognosis in the case. But the injury is of too great magnitude to be thus slightly passed by. "A large joint has been torn open, a terrible compound fracture is present, or several of the large muscles and nerves have been lacerated, and yet no corresponding disturbance is manifested." As Hunter has said: "Nature requires to feel the injury." All the functions appear to be performed in a healthy manner; the surface is of a natural temperature, the pulse undisturbed and the tongue moist and clean. But the patient presents an inquiring, anxious look about the forehead, eyes and upper portions of the face, while all about the mouth and lips is smiling and composed. It resembles a sadly cheerful expression, a melancholy smile about the lips which is indicative of a fatal termination. When you approach the bedside, the patient will look up at you with a stare of alarm and suspicion;

and he will repeat this expression as often as you approach him. His forehead will be drawn up and his brows contracted into a scowl of suspicion mingled with anxiety. Such cases are seldom amenable to treatment.

CHAPTER II.

HEMORRHAGE.

Arterial Hemorrhage.

SEVERANCE of an artery is known by the florid color of the blood that escapes and by the sanguineous fluid being thrown out in jets at each pulsation of the vessels. Wounds and lacerations of all classes may lead to arterial hemorrhage, which may also follow from gangrene or ulceration of arteries and always occurs in operations.

Nature always makes an attempt to arrest hemorrhage by thickening the blood into a clot at the point of injury. By this means the orifice is very frequently closed up and time given for inflammatory action to cast out fibrin and repair the abrasion of the tissues. Coagulation, however, does not always take place immediately, but the blood continues to flow from the orifice and is gradually formed into a coagulum upon the lips of the wound. If the opening is transverse, the process of natural arrest of the bleeding proceeds more slowly than when the vessel is incised in a longitudinal direction. Deeply seated arteries form coagula, other things being equal, sooner than those which have less depth of integument between them and the surface; for the blood that escapes among the tissues can not then pass away rapidly and coagulation proceeds without much molestation. For the same reason, natural or induced relaxation of the arterial system favors speedy arrest of the hemorrhage—mild systolic force being least likely to wash away incipient coagula. Acting upon this suggestion, the prompt use of lobelia, or immersion of the hands and feet in warm water, will assist the natural hemostatics by relaxing the vessels and lessening their sthenic action and restoring a better equilibrium in the circulation. If the flow is once fairly arrested and quiet enjoined upon the patient, the coagulum may hold firmly till the fibrinous exudation becomes molded into tissue, when no further danger need be apprehended. This spontaneous arrest of hemorrhage is witnessed oftenest in wounds and lacerations of the small vessels. Large vessels can not be intrusted to the spontaneous management of nature and surgical hemostatics are then called into requisition.

MANAGEMENT.—Hemorrhage may be arrested either by ligation, pressure, torsion, styptics or cauterization. These several classes of means should be made familiar by the surgeon, and the peculiar circumstances under which each class is most applicable should be clearly defined in his mind; for injuries are so common and coolness in the management of hemorrhage is so important, that nothing but an intimate acquaintance with every phase of this subject can render the surgeon efficient or enable him to appear to advantage when upon the field of action. His first duty is to undo all bandages and wrappers that may have been placed around the part, wash away all clot that has formed and thus expose the bleeding wound and bring to view the extent and position of the injury. The measures used must then be adapted to the circumstances of the case.

1. LIGATION.—This is the most effectual measure for the arrest of every form of arterial hemorrhage and may be used on all vessels whether deep or superficial. In all large arteries, and in moderate sized arteries that have been wounded transversely or opened by laceration or the advance of gangrene, ligation is the only measure upon which dependence should be placed. In order to apply a ligature, an assistant should first make pressure upon the artery and then the bleeding point must be brought into view by simple incision (when its situation makes this procedure necessary) and the vessel seized by a tenaculum, or pair of forceps, and disengaged from all other structures. The bleeding orifice must be distinctly withdrawn from the tissues among which the vessel is impacted, and the nerves and veins must be separated from the artery before the ligature is applied. These manipulations must be conducted with expedition, yet with all possible care; for, on the one hand, time is precious and, on the other hand, unnecessary violence may injure the coats of the vessel to such an extent that congestion, suppuration and death, may ensue.

No ligature should be used unless it is round, firm and even throughout. Very coarse white silk will answer in an emergency, but the surgeon's pocket case should always be provided with a parcel of dentist's silk and fine whip cord. Ligatures of the larger sizes are to be used upon such arteries as the humeral, femoral and popliteal. Having brought the bleeding artery into a proper position, the ligature may be passed under it by the finger or by an aneurism needle, according to the position of the vessel. The ligature should always be fastened beyond the aperture, and if it is tied at the distance of one-fourth of an inch upon the cardiac side of the orifice, it will be all the safer. The double knot should be used and the degree of tightness should be just that which will sever the inner coats of the arteries without doing violence to the outer coat. This point requires a little skill before it can be determined with exactness, but a steady hand can frequently feel the structures sever under the force used in tying the ligature. Looseness of a ligature is never admissible; for it may allow serious secondary bleeding—an unfortunate occurrence that always prostrates a patient much more than the loss of double the same amount of blood during the first hemorrhage. In cases of simple puncture of an artery, two ligatures must be applied—one upon the cardiac and the other upon the distal side of the orifice. This is necessary in order to provide against the hemorrhage that sometimes takes place after the establishment of collateral circulation. The same course may be pursued in other hemorrhages than those from simple puncture of the vessels.

After the main artery has been secured, the wound should be closed for a moment and then opened. Hemorrhage from other arteries will then be more easily detected, when each vessel should be secured by a ligature suitable to its size. Some surgeons are tediously minute in securing even the smallest pulsating vessels; but, while great caution is always advisable, especially in patients of strumous habit or feeble health, it must be remembered that nature is usually sufficient to close many of the smaller arteries, and less mischief will be done by committing some of the ultimate ramifications to her care than by wearying the patient in keeping him under constant probing and pulling for an hour or more.

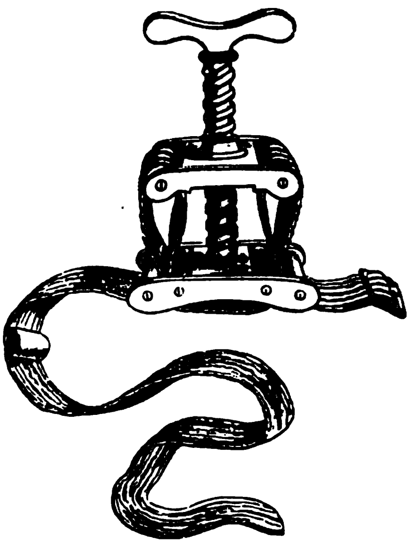
After the bleeding vessels have been thus secured, one end of the ligature should be cut off close to the knot and the other left hanging out of the wound; the edges of the wound should then be brought together and washed and dressed as in other cases. As the ligated extremity decays, it may be drawn away by the pendant end of the ligature. Some practitioners cut off both ends of the ligature and leave the wound unbandaged—a course of management that secures healing by granulation from the bottom of the wound.

2. PRESSURE.—Pressure is most applicable when a number of very small arteries are bleeding or when the hemorrhage comes from vessels imbedded in very dense structures. Temporary pressure with the thumb, finger or tourniquet, is always

useful to save blood when a large vessel is injured and ligation is about to be performed: sometimes it is efficient in retarding the impetus of the blood for a few moments and allowing a clot to form in the bleeding orifice, when the danger ceases. Usually, however, pressure must be continued for a length of time. It should always be applied with the utmost accuracy over the part upon which it is used, that the compression may not be greater at one point than another. Its successful employment also depends upon the nicety with which it is made to arrest the flow of blood without being carried to a point that will lead to mischief by producing congestion.

The *tourniquet* consists of a pad, screw and band. The band having been passed around the part, the pad is placed upon the site of the artery and the band buckled over it, when a few turns of the screw will tighten the whole and arrest the bleeding. Many forms of tourniquet have been devised, but the one of which a cut is here presented is in most common use. Compression in this form is applied in all operations where it can be brought to bear, its steadiness rendering it far preferable to the old method of using the fingers of assistants for checking the flow of blood. In hemorrhage from wounds, neither this nor any other mode of pressure is available unless there is a bone under or near the artery. In using the tourniquet, it should always be loosened slowly after the arteries have been secured by ligation; for the sudden admission of blood to an artery that has been thus temporarily obstructed, may force off nicely adjusted ligatures. This form of pressure can never be applied with the design of *permanently* arresting hemorrhage. The tourniquet may be rudely imitated by inclosing a cylinder of wood in a few thicknesses of muslin and using it as a pad. Tie a handherchief or piece of muslin about the limb, pass a stick under this bandage and obtain pressure upon the

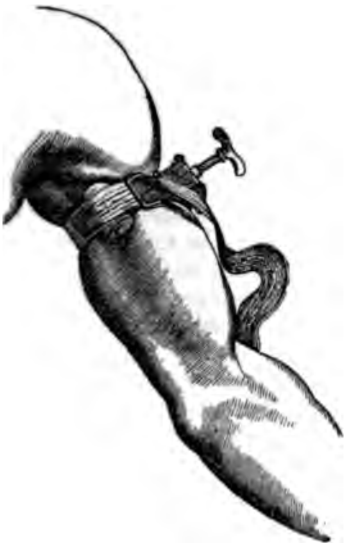
FIG. 29.



Tourniquet.

pad by twisting the stick and bandage any desirable number of times.

FIG. 21.



Tourniquet applied.

The permanent *compress* is made of circular pieces of lint placed upon each other, each piece being a little smaller than the one above it till a circular pyramid is formed. The compress having been prepared, the hemorrhage should be arrested by pressure with the thumb, a small dossil of lint is then fixed upon the bleeding orifice, the apex of the compress placed upon this and a bandage wrapped snugly over the whole. The size of the compress and the bevel given to its edges must be determined by the surgeon himself according to the position and circumstances of the particular case in hand. The skin beyond the point to which the pressure is applied, should be examined frequently and the bandage gently loosened whenever the surface becomes cold or there is evidence of capillary stagnation. A little bag of sand is sometimes laid over the compress in lieu of the bandage.

Bleeding from the rectum, vagina, nares and similar cavities, is generally checked by plugging with lint, sponge, suitable india rubber bags filled with water and similar direct compressive means. The plan is generally successful: but, as nearly all such hemorrhages arise from extra sanguineous pressure upon the parts, the loss of blood is most speedily and properly checked by inviting the circulation outwardly. For this purpose, the hands, feet and face, should be freely laved with water as warm as can be comfortably borne. Provision against future hemorrhages of the kind is best made by the occasional use of the vapor bath and the maintenance of quiet. We object to the plugging system till every thing else has failed. Epistaxis is frequently treated by placing the patient in an erect position and then elevating his arms. A solid placed under the upper lip and a bandage tied over it, is an efficient mode of employing pressure in the same cases.

3. TORSION.—This consists in drawing out the severed end of the artery and twisting it upon itself several times. The inner coats of the vessel are bruised or severed and coagula-

tion is favored. It is a rude mode of procedure and is never applicable to any arteries but those of the second size.

4. STYPTICS.—All styptics favor natural hemostatics by assisting in the formation of coagula. They are only applicable to hemorrhage from small vessels, where the discharge of blood is moderate and is not by distinct systolic jets. Cold water is the simplest and most universal of all styptic means. It should always be applied directly to the bleeding surface and not at a short distance from it; for contraction of the capillaries by water must force the blood to another part and there is no place to which it will flow so promptly and directly as to a surface from which a current is already escaping. Such an application of water will thus oftentimes increase, rather than retard, the hemorrhage—as may be familiarly witnessed when the face and neck are washed with cold water during a virulent epistaxis, or when cold is used upon the abdomen in uterine hemorrhage. Bring the surface to the air, when possible, and either irrigate it slowly with water or put on charpie and moisten the surface frequently.

Gallic and tannic acids are also powerful styptics when applied directly. Perchlorid of iron has been recently brought into very favorable notice. Geranium, quercus, kino, catechu and similar vegetable astringents, may be used for the same purposes.

5. ESCHAROTICS.—An application of a stick of nitrate of silver to a small bleeding artery will partially destroy the textures and cause them to contract, at the same time that it will favor coagulation. In bleeding from cutaneous and mucous surfaces, this measure can sometimes be employed to decided advantage. The actual cautery (a piece of red hot iron) may be employed for the same purpose, quickly crisping the tissues and forming an obstructive eschar. Small arteries can be treated in this way; and the actual cautery is sometimes applicable when hemorrhage occurs upon large surfaces and other measures have failed to arrest it. The iron should be passed very quickly and regularly over the whole surface, without being continued long enough at any point to cause deep destruction. It is a harsh operation and should be resorted to only under great emergencies.

Sudden and excessive hemorrhage may induce complete or partial syncope. This is the favorable moment for the application of a ligature or the tourniquet. If a shock has accompanied the accident that led to the hemorrhage, advantage must be taken of the stage of collapse to secure the bleeding vessels; and it is then best to secure reaction promptly, but by the use of those means that will preserve the circulatory apparatus in a relaxed condition rather than excite it to a too intense grade of action. Rest and a recumbent position are always to be enjoined; and pills made of lobelia, asarum and eupatorium, may be given to soothe the system and guard against febrile excitement. If an extremity is injured, it should be placed in the most elevated position that is convenient; for the power of gravity will check the ardor of the flow toward the part and favor the formation of firm coagula.

Secondary Arterial Hemorrhage.—A ligature may be pushed off or loosened, in consequence of the clumsy manner in which it was applied; a compress may have become loosened or be inaccurately fitted; some small vessels that did not bleed during the relaxation of shock or operation, may not have been properly secured; or gangrene may have occurred and destroyed an artery above the point of primary ligation. From all or any of these causes secondary hemorrhage may ensue, either within a few hours or a few days after the treatment of the primary accident. Bleeding at such times is very alarming, for the patient's strength will sink rapidly upon the loss of even trifling quantities of blood. The dressings must be undone and the bleeding vessel ligated upon its cardiac aspect as speedily as possible. Incision must be made through the soft structures and the ligatures applied at a proper distance from the wound. In some cases the main artery of the limb or part must be tied, but this should never be practiced when it can be avoided. The patient's strength may be sustained by drinks of ginger or small quantities of third preparation of lobelia. A case in which secondary hemorrhage has occurred, must be watched with the utmost anxiety and the progress of ulceration or the development of erysipelas must be managed according to the principles elsewhere directed for such affections.

Venous Hemorrhage.

Venous hemorrhage is known by the dark color of the blood and its continuous flow. Life may be jeoparded by the amount of blood lost, although the danger is by no means as great as in arterial hemorrhage; and most bleeding veins are naturally occluded by the formation of a coagulum and, ultimately, by fibrinous exudation. It is only when the vessel is large, or seated deeply, or connected with the return circulation of a very vascular part, that danger is to be greatly apprehended.

Ligatures upon veins are never admissible; for the inner coats will be simply puckered by the cord, and erysipelas, suppuration and pyæmia, are generally provoked by such an application. Pressure and styptics are the measures to be relied upon. In most instances, as after amputations, a proper approximation and bandaging of the flaps of the wound are sufficient to arrest the bleeding. In more persistent venous hemorrhage, cold water may be applied and the conical compress used at once. When the current of escape has been fairly checked, it will not be long till a coagulum is formed; and the slowness of the venous circulation is so little liable to displace this clot, that the healing of the wound or the obliteration of the vessel usually proceeds without molestation—rest, a recumbent position and relaxation by an occasional pill of lobelia, sufficing to favor the cure.

Effects of Loss of Blood.

Syncope may follow immediately upon a trifling injury or small operation. The fainting seems to be due more to a slight mental shock produced by the sight of the blood, than to actual weakness from hemorrhage. Place the patient perfectly flat upon his back and sprinkle a little water in his face and no fears as to his safety need be entertained.

Continuous faintings, following upon the repeated loss of considerable quantities of blood, are alarming. The system is rapidly exhausted, the pulse becomes thready and tremulous, wakefulness and staring delirium may ensue, the frame is greatly excited at the same time that it is prostrated and a febrile effort of the feeble, irritative form is established. These alarming symptoms usually occur in connection with loss of blood from severe lacerations, contusions or gunshot wounds, thus presenting a grave condition of things for the surgeon's attention. In feeble persons, a slight loss of blood will produce this excessive prostration and provoke these feeble manifestations. Patients in such a condition must be placed in a quiet, but very airy, situation, laid perfectly flat and treated with small and frequent doses of the third preparation of lobelia, zinziber, aristolochia or capsicum, in warm water. The hemorrhage must be checked and the wound or laceration managed as in other cases. If convulsions arise, they must be met by the treatment directed on pages 43–46. The diet must be light but decidedly nutritious and given every third or fourth hour. Great care and watchfulness are necessary to restore a patient who has once sunk into this low condition.

Anæmia sometimes results from long continued hemorrhage, as from bleeding piles and polypi. The blood is greatly impoverished in the number of its red corpuscles, the skin becomes of a waxy pale color, the head feels dizzy, the limbs are weak, the heart palpitates, the sight is either dim or unsteady, the bowels are irregular and the stomach is much troubled by nausea and indigestion. The source of the hemorrhage must be promptly attended to; and then the strength should be sustained by such tonics as hydrastis, populus, gentian and anthemis and a generous diet allowed.

Repeated and profuse losses of blood always weaken the hold of the life power upon the system and favor the destructive inclinations of the chemical laws. Gangrene is greatly favored and suppuration of the injured parts rendered probable, according as the hemorrhage is large and the patient already feeble. When destruction of the tissues commences, it must be met by local stimuli and constitutional invigoration, as has already been directed in the second, third and fourth chapters of Part II of this volume.

Hemorrhagic Diathesis.

This term is applied to that condition of the system in which there is profuse and intractable capillary hemorrhage following the most trifling accident. A scratch by a pin, an abrasion by a slight blow, an operation in which arterial and venous hemorrhage has been successfully treated, may be followed by a constant loss of blood that seems wholly insensible to styptics, recumbent position, actual cautery or any other known hemostatic measure. Life may be greatly jeoparded by this passive flow, or at least anæmia may be produced and the strength greatly undermined. Persons of light frame, thin skin and fair complexion, are most liable to this affection. The diathesis may be inherited and exist in childhood, gradually disappearing as years of maturity are approached; or it may be induced by habits of intemperance or a course of living that is calculated to lead to scurvy. The difficulty seems to consist, in part, of an impoverished condition of the blood, which is but poorly vitalized, thin and incapable of forming a good clot in consequence of the deficit in fibrinous material. The capillaries themselves, however, are secondarily involved in the inefficiency; for their inner coats are either very thin or entirely wanting, they are distended and their power of contracting under the influence of a stimulus is either lost or greatly prostrated.

This diathesis is a grave obstacle to the performance of operations, and the surgeon who finds himself called to attend upon a fair, thin skined and slender patient, should inquire carefully into that patient's peculiarities and habits. If he should find that the patient had been intemperate and was subject to epistaxis, ecchymosis, hemoptysis and other forms of capillary hemorrhage, upon trifling occasions, no operation should be attempted till a better condition of the blood and blood vessels has been established. Nothing but the most imperative necessity can justify the infliction of an incision in these cases.

TREATMENT.—Invigoration of the constitution is the only encouraging measure in the treatment of the hemorrhagic diathesis. Good and solid food, fresh air, sunlight, cheerfulness and abstinence from liquor, tobacco, coffee and every vice that can have an enfeebling influence upon the system, must be enjoined. The impurities that exist in the body must be depurated by bringing the proper medicinal influences to bear upon the skin, kidneys, liver and bowels. Digestion must be assisted by such tonics as populus, aletris, leonurus, columbo and liatris. We have found trillium latifolium a very valuable internal agent (in connection with the other means) and think it is well deserving of the notice of the profession. Vapor baths (combined with hygiene, tonics and alterants) are invaluable. These means must be employed steadily and perseveringly for months, before their benefit can be fairly felt.

When hemorrhage actually occurs, in a patient of this diathesis, the hemostatic measures that will arrest the flow become a source of anxious inquiry to the surgeon. Ligation *will not* do it, pressure may be of some account, styptics are likely to be most valuable, but the successful application of any measures is a matter of great doubt. All parties are forced to confess that but little is known upon the subject of hemostatics in this diathesis and the profession has yet to learn the medication best suited to this form of hemorrhage.

CHAPTER III.

WOUNDS.

Incised Wounds.

ALL solutions of continuity produced in the soft parts by sharp instruments, are classed as incised wounds; and no distinction is made as to whether this solution is the result of accident or of design on the part of a surgeon in performing an operation. When only the cutaneous or sub-cutaneous tissues are severed, the wound is of the simple character, but may become complicated and alarming when the cut extends more deeply and divides large blood vessels, nerves and other important structures. These wounds are always accompanied by a smarting pain, and the amount of hemorrhage depends upon the extent of the injury and the size of the vessels that have been severed. When a wound is in tensely drawn tissues (as over the tibia) or extends through a muscle and lies at right-angles to the muscular fibers, its lips will be separated and a wide gap shown. When loose parts are severed, or an incision through muscles is made longitudinally with the fibers, there may be no separation of the lips. In these latter cases, the hemorrhage is generally checked spontaneously at an early hour, although it may have been profuse at first.

TREATMENT.—The more simple the treatment of wounds can be made, the surer will be their reparation and the more time will be saved to the patient. The first procedure is to stop the bleeding (see last chapter) and cleanse the wound from clots and all foreign materials that may have found their way to it. The fingers are the best instruments that can be employed for this purpose, but the probe and forceps may be sometimes required, while dust or gravel may be washed away by irrigation with cold water—which also helps to arrest the hemorrhage. If the wound is trifling, its lips may be at once brought into apposition and retained by strips of adhesive plaster or a light bandage. But if the incisions have been wide and deep, the lips should be only partly approximated and thus maintained till capillary hemorrhage has ceased, the blood passed away from the gap and a glazed appearance has been given to the cut surfaces by fibrinous exudation. The lips may be then coaptated and retained in position by those applications that are most suitable to the extent, position and other circumstances connected with individual cases. These means may be appropriately classed under the heads of plasters, bandages and sutures.

1. PLASTERS.—These, aided by an easy and relaxed position of the parts, should be depended upon as far as possible; for they form the simplest and least irritating dressings that can be applied, and wounds that can be treated by them alone heal more readily than when the parts are maintained in apposition by other means. Isinglass and resin plasters are both used, but the former is preferable in all cases where moderate adhesion will answer. The plaster, having been

cut in strips of suitable size and placed in a handy position, the lips of the wound are to be brought closely and snugly together. One end of a strip of plaster may then be fastened on the skin for a distance of one, two or four inches upon one side of the cut and carried carefully over and fastened for the same distance upon the other side. The integuments must not be pinched nor puckered under the plaster; and the strips should be long enough to take a good hold upon the skin, but they should never be multiplied and crossed and lapped upon one another till the wound is hidden by a mass of them. The objects are ease and lightness, and, to secure them, the least possible number of strips of plaster should be used.

2. BANDAGES.—These are employed as aids to the plasters and are seldom sufficient (in themselves) to preserve coaptation in soft parts that have been extensively divided. The simple roller bandage is the one in most common use. Compresses upon each side of the wound may be used in connection with it, when the gap is deep and extensive, when there is an inclination to separation of the lips or when the hemorrhage is disposed to be obstinate. The starched bandage is preferred by some surgeons and is valuable in long wounds upon the extremities. These applications should always be made as light as possible—too much pressure and too many folds of muslin being avoided on the one hand and too much looseness in the coaptation on the other.

3. SUTURES.—When a wound is extensive, when it is strongly disposed to gape or when a portion of tissue has been cut away, sutures are the most certain and available means that can be employed to secure approximation of the parts. Sutures are of four kinds: 1st. *Interrupted*, in which a piece of silk is passed through both lips of the wound, at a suitable distance from the edges, and then tied. Two or three of such stitches may be made in the course of a gap. 2d. *Twisted*, in which curved needles (made on purpose) are fixed into the lips of the wound and silk wrapped over the points of these in the form of a figure 8. 3d. *Glovers*, or *continued*, in which the suture thread is carried over and over the lips of the wound, in the manner followed by tradesmen in sewing gloves. 4th. *Quilled*, in which the textures are transfixed by a ligature (as in the interrupted suture) and a quill, or other round substance, tied upon the pendent ends of the ligature, one on each side of the wound. The position of the parts and the extent and form of the injury, have much to do in determining the kind of suture that should be preferred. The surgeon must rely upon his own judgment in making

his selection, but hints as to which kind is most likely to be adapted to particular classes of cases, will be given at different parts of this volume.

Whatever form of stitch may be used, a few general rules must be observed in their employment. Thus, the needles should enter the skin at the distance of about one-fourth or three-eighths of an inch from the edges of the cut. The depth to which they should penetrate may vary from an eighth to half an inch, the deeper stitches being taken when the wound is deep and gaping. The stitches may, generally, be placed one inch apart, but less distances between them are sometimes necessary, and half an inch is all that may be allowed in some cases. No violence is ever admissible in tying or twisting a suture, and the least possible force that will answer to bring the parts together (the patient having been placed in a proper position) is all that is allowed by judicious surgery. Plasters (and, generally, bandages) should lend their aid to the sutures, and ligatures and needles should be removed from the integuments just as soon as that degree of adhesion has taken place which will justify the belief that the before mentioned means will be sufficient to continue the coaptation. They always prove sources of irritation and often retard the healing process by provoking suppuration. On these accounts, their use is decidedly objectionable and they should be resorted to only upon occasions where the other means give no chance of accomplishing the desired end. Surgeons are generally too prone to resort to sutures in all cases; but a little more reliance upon more gentle coaptating measures will be found, even in very extensive injuries, to answer every purpose. Yet sutures are sometimes positively necessary to keep the edges of a wound evenly approximated.

After a wound has been dressed, the patient should be kept as quiet as possible and on a bed; relaxing teas should be administered and the diet should be moderately light. The wound itself should be handled as little as possible—the surface around it being duly cleansed from time to time and the plasters allowed to remain unchanged as long as they continue to be firmly attached to the integuments.

When the process of reparation advances favorably, the plastic material that is thrown out upon the surfaces of a wound becomes organized into a living tissue and completes the union of the parts within from three to eight days, according to the extent of the injury. When the patient is healthy and vigorous and the cut surfaces have been brought together closely throughout their whole extent and without any clots between them, this mode of union is likely to take place. It has been termed the process of "healing by first intention"—the designs of the vital force not being thwarted and there being no forced necessity for resorting to the more tedious process of granulation. It is to secure this favorable exudative adhesion that the surgeon must labor, to which end all possible gentleness must be exercised and meddlesome interference avoided. Dragging sutures, heavy and tight bandaging, puckered edges, irritating plasters, rude squeezing and pushing during coaptation, the allowance of a position that will put the tissues on a stretch and negligence in keeping the system in an open condition, will all retard speedy reparation and favor suppuration upon the cut surfaces. Much delicacy of manipulation is required to nicely adjust the lips of the most direct incised wound, and there are few operations in which the surgeon is more likely to demonstrate either his fitness or entire unfitness for the chirurgical calling.

Adhesion can only take place by an exudation of fibrinous plasma and this is always formed by inflammatory action—the intensity of the action varying according to the extent of the wound, the health of the patient and the presence or absence of provocatives. It is the surgeon's duty to keep the system in a relaxed condition, that arterial friction may not excite febrile manifestations and that crudities may be readily cast out by the vital force and not get entangled in the wound to retard its reparation. But the best of care will not always succeed, and suppuration may ensue and the process of granulation may be commenced. The advent of this condition of things may be known by a purple or slightly livid hue around the wound, the edges of which will swell, become painful, lose their sharpness, puff out and separate from each other. The moment that these evidences are observed, all sutures must be removed without delay, close bandages and wrappers must be taken off and a free way of escape made for the purulent material. Then the surgeon must retain the plasters, use the simplest form of water dressing, medicate the water with gentle stimulants when the sore needs it, maintain quiet and treat the wound according to its character; for it is now nothing more nor less than an ulcer and is to be managed on the same principles and by the same means that have been already advised for sores under other circumstances. The constitutional treatment must be constantly continued, and nothing should draw the surgeon's attention away from the importance of preserving the nutritive powers of the system, without which no sound plasma can be exuded and no successful reparation take place.

Poultices are not admissible, unless gangrene and sloughing should threaten—accidents that very seldom occur in the course of incised wounds, except when some capital operation has been performed under circumstances adverse to healthy adhesion or granulation. But of all dressings that can be applied in simple cases, there is none that can equal the common water treatment that has been advised for the *simple sore*. If the constitutional treatment has been vigorous from the first, it is seldom that any other local application will be needed.

Lacerated Wounds.

This class of wounds is always produced by rude violence and is the form that exists in all abrasions made by blunted instruments, balls, shot, the teeth, claws and horns of animals, machinery, &c. These wounds are seldom painful; for the violence that caused them is sufficient to blunt, even if not to temporarily destroy, the sensibility of the parts for some distance around the seat of the injury. There is little hemorrhage except when large arteries or veins are laid open—the extremities of lacerated vessels being always strongly inclined to form coagula and check the flow of blood. The lips of the wound are ragged, gape moderately and are surrounded by ecchymosis. When the violence has been done by machinery, it is not uncommon to have the integuments torn into shreds, the blood vessels and tendons may hang out and the bones may be crushed into minute spiculæ. Similar appearances may be presented in lacerations caused by balls, fragments of blasted rocks and other bodies thrown into forcible motion by powder. In this class of cases the danger of the difficulty will probably be increased by the lodgment of some pieces of the lacerating substance.

No other class of wounds produces such extensive shock upon the system, for even trifling lacerations sometimes become the occasions of serious, if not fatal, collapse. The shock is frequently of the insidious character (see p. 288). And when the immediate effects of the violence have been overcome and reaction has been established, a still further danger awaits the patient from the sloughings that generally take place. The absence or mildness of the pain and the slightness of the hemorrhage should not be allowed to deceive the surgeon into a false security; for the bruises of the soft parts are generally sufficient to cause extensive and immediate stagnation, and suppuration must follow in all cases and gangrene is almost a certainty when the wound is of considerable size. Indeed, there is no class of circumstances that produces more rapid and intractable destruction than mechanical violences; and the surgeon may well stand in anxious dread of all such wounds, even though their sizes may appear to be inconsiderable. This form of destruction is more especially to be dreaded when an erysipelatous inclination exists in the system. Sometimes the sloughs are superficial and limited to the space over which the ecchymosis has spread; again, they are deep and involve all the structures; and sometimes the pus of decay burrows under the muscles, advances for considerable distances among apparently sound tissues, leads to gangrene without any clear line of demarkation and may even find its way into the veins and lead to pyæmia. Convulsions are very commonly provoked by injuries of this character and tetanus sometimes complicates the difficulty and greatly lessens the chances for recovery.

TREATMENT.—There is an almost endless diversity of form, position, extent, complication and danger, in lacerated, as well as all other, wounds and the treatment needed in particular cases will be as diverse as are the cases themselves. At times, the application of a plaster or the recommendation of a lotion will answer every purpose; while, again, all the energy of a disciplined mind and all the skill of well trained hands will be required to meet the demands of an emergency. As the simpler cases are of trifling moment, we will direct our attention mainly to the management of the graver forms of these accidents. Having stopped the hemorrhage and placed the patient in the most favorable position, the surgeon is next to cleanse the wound of any foreign materials that may have been lodged in it. Not a grain of sand nor a spicula of bone should be allowed to remain. The probe and forceps may be required to effect the removal of some solids, though the fingers are best when they can reach the material without causing further contusion. In some instances, as when a solid has entered the integument and then suddenly changed its course and lodged at some distance from the point of entrance, the scalpel may be needed to open a direct passage to it. All loose shreds of tendon should be cut off and a stream of cold water laved gently over the parts. Much care must be taken to handle the parts as tenderly as possible and not a line of flesh should be cut away, no matter how greatly it has been mangled and bruised. So long as a vital connection with the body is retained, the part may be saved and these torn fragments of tissue should be at once adjusted closely to their places, held there (if large) by a few twisted sutures and covered (if small) by a layer of lint and collodion. These little adjustments should be made at the earliest possible hour; and, if the violence has caused collapse, all due haste should be made to get the wound dressed before reaction comes on, as the patient will thus be saved the pain and excitement necessarily attendant upon dressing these wounds. If ecchymosis and laceration are extensive and the occurrence of gangrene strongly probable, a poultice of lobelia and capsicum in ulmus should constitute the first dressing and may be left on for six hours or till consciousness and feeling in the part are fully restored. If the lacerations are not extensive, the wound may be bathed freely with pure or diluted compound tincture of myrrh and then wrapped with loose bandages of linen wet with the same preparation.

After the first dressings have been applied, the patient should be left to rest, a few doses of third preparation of lobelia being given to sustain the nervous and sanguiferous systems. If tetanus should occur, its treatment must be at once commenced as will be presently directed in the section upon Gunshot Wounds. Intense febrile manifestations are likely to arise, and these must not only be met but anticipated by appropriate medication. Pills of lobelia should be administered every second or third hour, asclepias or eupatorium perfoliatum should be given freely in warm infusion and leptandra should be employed to unload the bowels. If the febrile action is intense, it should be relieved by plenty of lobelia in both drink and enema; if the pulse becomes fluttering and the patient is feeble, restless and disposed to sigh, aristolochia, zinziber, third preparation of lobelia or capsicum, must be used at once. It is of vital importance to commence this course of constitutional treatment early, for the successful management of the wounds depends very much upon the purity and vigor of the system at large. Simple lacerations may become serious by neglect of this course; while extensive injuries may terminate favorably and even limb and life be saved in apparently hopeless cases by thorough and careful attention to the condition of the whole system.

When, after six hours or two days (varying in different cases), the limb swells, pits upon pressure and becomes cold, it is evident that some portions of the lacerated structures are about to slough away, and poultices of capsicum, myrrh and lobelia, with ulmus, must be then applied to the parts. By these measures, vital action will be sustained in the tissues yet alive and the early separation of the sloughs will be favored. Such stimulating applications must be continued as long as the appearances of this form of destruction continue and the constitutional treatment must be then pushed with renewed thoroughness. The case is to be conducted on precisely the same principles as any other case of gangrene; and, in like manner, if erysipelas or pyæmia set in, they must be met by the means that were directed for these difficulties in Part II of this volume.

When the spread of gangrene has been checked and the sloughs have been separated, the wound generally presents the appearance of an ordinary healing sore. If the patient is robust and has been properly invigorated by constitutional treatment, this sore will advance steadily toward reparation and the simple cold water dressing will be the most appropriate application. If fungous flesh appears, astringent powders should be sprinkled upon it; if granulation ceases and the sore sinks into a partially indolent condition, the system must be aroused by emetics and baths and stimulating applications made to the ulcer; if the wound is deep, its edges must be kept apart, that pus may escape readily and granulation be allowed to advance steadily from the bottom. By thus managing the wound according to its condition (or according to the class of ulcer to which it belongs), its reparation generally advances to a successful termination.

All lacerated wounds, however, are not amenable to treatment, and the extent and position of these injuries may sometimes make amputation necessary. When all the bones and soft parts of a limb have been crushed by machinery, a railroad accident or any other violence; when a large joint has been laid open and the bones connected with it have been crushed, or when the soft parts have been stripped away from a bone, immediate amputation must be practiced and that, if possible, before reaction becomes fully established. But the surgeon must be very careful about tarnishing his knife in lacerations of less frightful moment than the cases here enumerated; for unpromising and extensive wounds of this kind may be successfully healed by care and energetic medication, and it is far from creditable in a surgeon to resort too quickly to the use of his instruments. If the soft parts alone are injured, if only the bones of the hand have been crushed, if the wound in the upper portions of an extremity constitutes a plain case of compound comminuted fracture and is not accompanied by actual crushing or powdering of the bones, there may be fair chances of recovery without amputation. It is, at least, advisable for the surgeon to wait a little time, in such cases, and apply his means thoroughly for a few days. Then, if mortification should threaten to cut off the whole part, the knife will be the only alternative and must be used promptly. It is true that those delays may involve the patient's health a little, but they do not jeopardize his life; and when a fair possibility of saving a limb exists, it should not be let pass untried. With the powerful constitutional invigorators found in the materia medica of the Physio-Medicalist, many apparently hopeless cases of this kind have been, and (to judge the future by the past) can again be, saved from the knife.

In determining the question of amputation, the surgeon must bear in mind the following facts: Old persons are less tractable to treatment than the young. Ill health, strumous inclinations, cancerous cachexia and syphilitic and mercurial taints, diminish the chances for successful medication. Injuries of the feet are less likely to be cured than similar lacerations in the hands; and injuries of the upper extremities are not as dangerous as those of the lower extremities.

Gunshot Wounds.

Wounds caused by gunshots are but a variety of the lacerated injuries; yet the authority of custom, as well as the peculiar instrumental treatment sometimes demanded in accidents from balls, justifies the plan of considering them under a separate head. The extent of the injury, the appearance of the parts, the constitutional symptoms and the degrees of immediate and ultimate danger, are all subject to every conceivable variety. There may be the most trifling abrasion of the skin or complete amputation of a part; a small and smooth orifice or unsightly demolition of structure; a mere temporary anxiety lest serious injury has been done or overwhelming shock from which the patient never rallies; speedy reparation of the injury, excessive internal hemorrhage causing immediate death or more tardy gangrene and erysipelas among the deeply seated structures, leading to prostration, hectic and pyæmia. Fortunately, these wounds are common only upon the field of battle; yet they occasionally occur in private practice, particularly in large cities, and the circumstances of their infliction, as well as the anomalous appearances they sometimes present, always render them very interesting to the surgeon.

Different kinds of projectiles cause injuries of different extents and characters, which Mr. Erichsen (p. 121) has thus happily described: "Gunshot injuries of a serious character may be inflicted by weapons charged only with powder. This may injure by the mere concussion of the explosion. * *

In other cases a portion of the powder, unexploded, may be driven into or through the skin by that which is exploded behind it. In this way very troublesome and disfiguring marks are not unfrequently inflicted on the face and other parts of the body, by the charcoal of the powder being driven into the skin. [When the powder is very coarse, each grain may cause a distinct mark, like those of small shot when discharged at a considerable distance from the body.] * * Wadding and soft materials, as pieces of clothing [forced into the skin by the powder], will occasionally inflict serious wounds by the force with which they are driven. * * Small shot often inflict serious injuries. If the person wounded be within a few feet of the muzzle of the gun, a terribly torn and lacerated wound, of a very serious character, even worse than that occasioned by a bullet, will be inflicted; for the shot, not being scattered, is driven through the body in a solid, compact mass, tearing the tissues to a great extent. The shot, scattering as it flies, produces, at a greater distance, a less serious injury, usually lodging in the sub-cutaneous cellular tissue. * * Bullets, slugs and grapeshot, occasion more serious wounds than any that have yet been described, lacerating soft parts, fracturing and crushing bones, tearing asunder vessels and nerves, perforating the viscera and occasionally cutting off parts (as a finger, the nose or an ear) and thus giving rise to every possible variety of injury." Fragments of stone or metal in blasting, splinters of wood or pieces of earth forced into the skin by the striking of a ball and the injuries to the eye by the splitting of percussion caps, are also classed among gunshot wounds. A spent ball may strike the body and cause overwhelming shock or instant death by concussion, and yet produce no abrasion and leave no particular evidence of external violence.

Shot and balls do not always penetrate in the line of their entrance, but may be diverted from their course by the most trifling influence, as a button, the position of a bone when struck, the elasticity of the part first penetrated, &c. Cannon balls, unless spent in their force, are seldom diverted in their course, but usually carry away the whole mass of structures against which they strike. Substances extraneous from the shot (as wadding, clothing, earth and splinters) usually lodge in the system; the ball itself may also lodge or pass through accordingly as the distance from which it was discharged has been short or long. The aperture of entrance is usually small, round, slightly jagged and inverted; that of exit is generally larger, rougher and everted. Sometimes the wound of entrance is as large and rough as that of exit.

Occasionally a ball will strike the edge of a sharp bone (as the tibia) and be split, when two apertures of exit may be found; or one of the portions may pass out and the other lodge in a bone or among the soft structures. The lodgment of rough substances always provokes extensive suppuration or even gangrene; smooth balls or shot may lie embedded in the flesh for years and cause no material inconvenience. When packed into a bone, however, balls generally lead to extensive necrosis and sometimes to mortification of the limb; and copper balls are always more injurious, in this respect, than leaden ones.

The pain of gunshot wounds is dull and aching and feels much like a bruise; sometimes it is very trifling, again it may amount to an intense throb. The shock is generally much less than should be expected from the position and seriousness of the wound; and death sometimes takes place within a few minutes after the reception of the injury—the doomed man remaining almost unconscious of a wound till he sinks in his tracks. When shock does occur, it is likely to be severe and is a good criterion of the seriousness of the case; for deep depression may be said to never result from trifling and unimportant wounds of this kind. The hemorrhage may be very small, or it may be profuse and alarming when large vessels have been torn open. Sometimes there will be no material outward show of blood, yet profuse and fatal hemorrhage may take place internally.

When the patient recovers from the shock that may have been produced by a gunshot injury, when hemorrhage has been checked and danger from that source averted, and even when the ball, shot and other solids, have been removed, a grave train of accidents are liable to supervene. Suppuration is sure to follow, even though the injury has been but a flesh wound; for union by first intention is here impossible, reparation can only take place by the formation of granules and the lacerations are generally sufficient (even in favorable cases) to lead to very small sloughs along the passage made by the solid. The extent to which suppuration may advance can be determined only after the lapse of a number of days, especially when offending substances have lodged in the body. Pus may accumulate and decay advance slowly among the deep parts, when an irruption will suddenly take place and carry away large masses of flesh by mortification, sparing neither blood vessels nor tendons in its destructive course. Or one abscess after another may form in the remote structures; or caries and necrosis of bone may follow; erysipelatous destruction may undermine the constitution and death supervene by the slow accession of pyæmia. Even after the solids have been extracted, the same train of accidents may follow in the course of treatment, added to which may be obstinate hemorrhage upon the separation of even small sloughs, non-union of fractured bones and even tetanous, that most fearful of all forms of mucular manifestation.

TREATMENT.—The management of gunshot wounds is to be, in all respects, similar to that already directed for lacerated wounds. Reaction must be favored quickly; hemorrhage must be stopped; foreign solids must be removed as speedily as possible—by the finger, if practicable, by the aid of long forceps, probes, bullet screws and incisions, when necessary; quiet must be maintained and a thoroughly relaxing course of constitutional treatment at once begun. Cold water dressings must be employed in all simple cases; gangrene must be either averted or limited by stimulating poultices and invigorating constitutional medication; abscesses must be discharged early and the several conditions managed on the same principles and by the same means that have been advised for similar conditions under other circumstances. Inflammation, congestion, suppuration, gangrene, erysipelas, necrosis and ulceration, partake of the same general character in all cases and are always of the same nature, whether induced by a bruise, the inoculation of poison, mechanical violence, systemic impurity or bullets and slugs. They are all so many different phases of the struggle for supremacy made between the vital force and the laws of chemical affinity. It is the surgeon's duty to aid the vital force and endeavor to maintain its authority over the tissues of the frame; and the means that have been efficient in securing this end at one time and under one set of circumstances, will be equally efficient at all other times and under all other circumstances (no matter how diverse) that have brought about the same conditions. To avoid an endless tautology (into which all authors confess it is easy to fall), the student is referred to the chapters of Parts I and II of this volume, where he will find all the medical treatment that will ever be required in the management of gunshot, or any other, wounds.

The question of immediate amputation frequently arises in these cases and calls for all the prompt and prudent decision that the cultivated surgeon is capable of exercising. The considerations which should determine this point here, are the same as those which have been already laid down for the determination of the same question in cases of lacerated wounds, to which it is only necessary to add that amputation should be performed in all cases where a cannon ball has carried away a limb and left a rough and unmanageable stump. The best period for performing the operation is just after the restoration from the shock and before the accession of full reaction.

Tetanus.—Tetanus consists in permanent and rigid spasms of the muscular system, affecting either a part or the whole of the motive apparatus. It may arise (in very feeble and half starved persons) without any apparent external cause, but it much more commonly follows after wounds, burns, fractures and other accidents, when it obtains the appellation of *traumatic* tetanus. Its occurrence after the infliction of gunshot wounds is so common that it may be very properly discussed in this connection. As the manner in which spasms and convulsions are produced has been already fully discussed upon pages 39–42, the student is directed to a careful re-perusal of that section, while we will at once proceed with the practical departments of the question now before us.

EXCITING CAUSES.—Wounds are the most common provoking causes of tetanic spasms and lacerated and contused wounds are the classes that are most frequently concerned in exciting this form of tonic rigidity. Simple incised wounds, made during any surgical operation or occurring accidentally, may, however (under circumstances to be presently mentioned), lead to tetanus; and simple bruises, falls, strokes of a whip and other violences in which the skin has suffered no abrasion, have also been known to become immediate exciting causes of similar manifestations. Intestinal irritation, uterine tenderness after abortion and foulness of the stomach, have also been directly associated with the production of tetanus. In traumatic tetanus, these local and pre-existing irritations, probably, have much to do in developing spasms after injuries—increasing the liability to tetanus in all cases of accident and being necessary to its development under the infliction of limited simple incisions. General debility of the system is also a prominent predisposing cause; and the starved, the sickly, the fatigued and those who inhabit tropical climates or live upon bad food, are much more liable to this accident than the vigorous, the healthy and the temperate. Injuries of dense structures that are well supplied with nerves, as the fingers, feet and knees, are much more likely to excite tetanus than similar wounds or violences upon softer and less sensitive parts.

SYMPTOMS.—Slight stiffness about the angles of the jaws is usually the first symptom of tetanus. The patient is unable to open his mouth widely, is disposed to yawn or breathe heavily and has a slight involuntary smile upon the face—the result of contraction of the facial muscles connected with the angles of the mouth and eyes. The jaws eventually become permanently stiffened; the muscles of deglutition become contracted and cause pain along the esophagus, with difficulty of swallowing; the countenance is drawn into a kind of grim smile known as *risus sardonicus;* a pain at the pit of the stomach is next felt; the back and arms feel rigid and the tonic spasm advances steadily to the extremities. When the whole muscular apparatus is affected, the patient lies in a frightfully rigid condition, with the abdomen drawn in, the jaws firmly set, the eyes staring and the unswallowed saliva running from the mouth. This condition may continue for hours and then slowly loosen a little, to return with increased and sudden violence in a few minutes after. Sometimes the spasms abate and recur frequently—never departing entirely, but agitating the sufferer with violent and painful jactitations. Sometimes the muscles of the back will be principally affected by these paroxysms, when the patient will be twisted backward and supported upon his head and heel (*opisthotonos*). Occasionally the body is thrown violently forward (*emprosthotonos*), or it may be drawn to either side (*pleurosthotonos*). These partial spasms do not often continue for more than a few minutes, but they are extremely painful and violent while they last and exhaust the patient very rapidly.

The skin of tetanic patients is generally cold and sallow; the bowels are always constipated; the urine is either suppressed or retained, or both; swallowing is impossible in all except transient cases; the mind is generally perfectly clear till toward the last; the pulse sinks measurably; a strongly pungent perspiration may bedew the skin and death is almost a certainty unless the proper measures of treatment can be brought to bear at an early hour.

Tetanic spasms may occur within a few minutes after an injury and terminate life within twenty-four hours. More frequently, however, no symptoms of the convulsions are felt till the third, fourth or fifth day after the wound, and the patient seldom dies till the third or fourth day after the accession of the spasms—sometimes living six or seven days. In more rare cases, the spasms do not come on till the tenth or twelfth day, and they have been known to be delayed till a fortnight after the injury.

TREATMENT.—Having first taken care of the wound and removed any and every foreign solid that has been lodged in it, the bowels must be next unloaded by large enemata of lobelia. The pulverised seeds of lobelia mixed with ulmus water are best and should always be given in large quantities, as both local benefit and constitutional relaxation will be thus secured. A cot should be then fixed in a suitable manner and the patient placed on it and a very mild vapor conducted under it. A weak infusion of lobelia having been made, small doses of it should be given frequently while the patient is in this position. Hours may be required to loosen the tissues of the system, but (the temperature being very mild) the bath and the lobelia should be continued without intermission till the desired object has been accomplished. No fears need be felt in this free use of these means; for tetanus disappears just as soon as the patient becomes relaxed and vomits, when a free use of eupatorium, asarum and salvia infusions, will complete the cure.

But the jaws are so firmly locked in a great many cases, that the exhibition of medicine by the mouth is rendered impossible. Under such circumstances, the practitioner may depend mainly upon enemas of lobelia, together with the mild vapor bath or wet sheet packs medicated with lobelia. In order to have the clysters retained, they should be made of lobelia seeds and ulmus powder and mixed in small quantities of tepid water. The injections should not exceed two or three fluid ounces in bulk and may be repeated, if retained, every hour, or every twenty minutes when not retained. Drinks of sage or asarum should be given just as soon as the jaws become relaxed; and a few small doses of diluted third preparation of lobelia will then expedite vomiting and afford great relief to the system. It is not often that the spasms recur after having been once broken; but, if they do return, the same mode of procedure is to be repeated.

To those who are unacquainted with the nature and power of lobelia and the vapor bath, this mode of treatment may be at once cast aside with a sneer and the routine of ice, opium and bleeding, be again resorted to. Not being here engaged in therapeutical discussions, it will answer our purpose to say, that this mode of management has relieved innumerable cases of the most violent and hopeless degrees of tetanus and has very rarely failed where it has been thoroughly and perseveringly employed. Cure has followed the proper exhibition of these agents with such direct and constant certainty, that no further proof *should* be asked to convince the truly liberal minded that those measures are fully deserving of every confidence that may be placed in them. To secure their full benefits, however, they should not be mixed with opium, ice nor chloroform, but tried and depended upon in company with only such auxillaries as scutellaria, eupatorium, cypripedium and other nervines. It is also necessary that the lobelia should be exhibited perseveringly, and it is not sufficient to apply it for an hour and then resort to other measures—keep it up for a week, if need be, and employ all the lobelia that can be given, even if the seeds are required by the pound. All authors have acknowledged that tetanus is quite incurable under the old methods of management; but it has been so repeatedly cured by the measures here recommended, that we can safely say it will yield to this treatment as readily as other acute cases of disease will yield to any mode of treatment, and those instances in which it will fail will be of extraordinary severity.

Poisoned Wounds.

Dissection Wounds.—Wounds made during dissections and post mortem examinations are not often alarming, but sometimes become very severe and fatal. When the body is recently deceased, the danger following introduction of materials from it is generally greater than when it has been deceased for several days. Subjects infected with venereal, and those who have died from peritonitis, phlebitis and other forms of erysipelas, are especially dangerous, and the anatomical student who works over them and keeps himself free from even the slightest scratch, may suffer seriously from absorption of the effluvia arising from the bodies.

SYMPTOMS.—In slight wounds, the integuments swell, become purple, suffer a stinging pain, discharge a little pus and, in the course of a few days, the wounds heal over and disappear. But if the wound is of a more poisonous character and the recipient of it has been jaded by study or broken down by disease or dissipation, a series of grave symptoms will soon manifest themselves. Rigors, nausea, deep sense of depression and profuse and fetid diarrhea, commonly seize the patient within twenty-four hours after the infliction of the injury. Red streaks extend from the wound along the track of the lymphatics and these vessels are swollen, painful and disposed to suppurate, and abscesses may form in the axillæ and under the pectoral muscles, the strength may remain greatly depressed for a few days and then be gradually restored upon the discharge of the pus; but the absorption of the poison may proceed and the whole system become impregnated with it. Diarrhea and perspiration, of a truly cadaverous odor, continue; but as nature fails to thus cast out the poison as rapidly as it accumulates, these channels gradually close up and huskiness of the skin and constipation of the bowels, may follow. The pulse becomes small, tremulous and rapid; the tongue and teeth are soon covered with dark sordes; erysipelas of the phlegmonous form extends rapidly along the limb and over the body and sero-purulent infiltrations are extensive; a low delirium sets in, abscesses form in the axillæ and in numerous other parts of the body and the patient soon dies—a mass of putrefaction. Under such a degree of poisoning, life seldom holds out longer than ten or twelve days from the reception of the injury.

TREATMENT.—In simple cases, where the difficulty remains entirely local, a few poultices of cayenne and lobelia in ulmus will be all that is necessary. When the system at large is infected, nature's hint must be followed and every means taken to eject the poison by the skin, bowels, kidneys and lungs. The skin and kidneys are particularly available for this purpose, as they can be induced to act very intensely without being fatigued by over exertion. Vapor baths must be administered at least twice every day, and they should be given directly after a searching emetic in which composition has been used as a drink. These emetics must be made thorough and searching, for they will almost literally break up the fountains of disease and prepare every organ in the system for the labor of ejecting the poison. The diarrhea need not be interfered with, unless it becomes very profuse and debilitating, when it may be checked by a few enemas of hamamelis or myrica. If costiveness exists, it must be relieved by enemas of lobelia and zinziber and doses of leptandra and capsicum. Drinks of zinziber and asclepias, hedeoma, composition, salvia and aristolochia and similar diaphoretics, must be given constantly. The erysipelatous limbs must be enveloped in liberal poultices of lobelia seeds and the patient managed as has been already directed for aggravated forms of erysipelas with typhoid manifestations. Abscesses must be opened at an early day and convalescence aided by appropriate tonics.

Bites of Serpents.—The rattlesnake (*crotalus horridus*) and the copperhead (*boa crotaloides*) are the most formidable serpents of this country, the coluber naja infests India, while Africa and Southern Europe are stocked with the cerastus or horned viper. The wounds inflicted by these reptiles are very dangerous, the poison discharged from the apex of their fangs pervading the whole frame in a few minutes and generally proving fatal (upon man) within twenty-four hours after the infliction of the bite, though, in a few instances, life has held out ten and twelve days after the infliction of the injury. These wounds, however, are most actively poisonous when inflicted during the heat of summer or while the reptiles are procreating. In like manner, the venom of serpents in tropical climates is greater than that of the same serpents in more temperate latitudes; and one or two bites from a snake seems to so far exhaust its virus, that a wound inflicted by it for the third or fourth time, does not often prove dangerous.

Symptoms.—The virus of truly poisonous serpents sometimes influences the nervous system so powerfully as to produce collapse and death within a few minutes after the infliction of the wound. The surface becomes cold and bedewed with a clammy sweat, the eyes sink in their sockets, respiration becomes laborious, the pulse trembles, the mind becomes unconscious and the life power yields with scarcely a struggle. More commonly, however, there is a simple sense of depression for a few moments, with a clammy sweat upon the face, and then the patient rallies. The virus is now conveyed to the circulation, steadily producing prostration and at the same time provoking vital resistance of the lowest erysipelatous form. The wounded part swells, presents a mottled greenish purple appearance and suffers from a kind of smothered ache. The lymphatics soon swell, the surface becomes cold and the body looks puffed up, faintings occur and the mind generally remains clear, but sometimes there is a little incoherency. If death does not occur at this stage of the poisoning, red spots appear at different points upon the surface, being due to sanious and purulent infiltration; the parts around the wound begin to mortify, or at least turn very green, the pulse and respiration become gradually more labored and death soon supervenes. All these symptoms may not occur in every case, and many venomous wounds of this class do not prove fatal—either the virus of the reptile being too feeble to do much mischief or the health of the wounded person being sufficiently vigorous to rally and resist the poisonous influence.

Treatment.—The rapidity with which death follows the wound of a venomous serpent frequently renders medication useless, if not impracticable. When, however, the system rallies against the first shock of the poison, vigorous treatment may prove effectual in casting out the virus, invigorating the system and saving life. The means used should be of a largely relaxing and moderately stimulating character; and those agents that exert their influence principally upon the nervous system are best. In commencing treatment, however, the practitioner should bear in mind that nothing but the most unmeasured use of a medicine is likely to be of any avail.

The concentrated tincture of lobelia stands foremost among the agents that may be used. It should be given in large draughts every few minutes, that complete relaxation may be secured in the shortest possible space of time. Half a teacupful every five minutes would be none too much; and the addition of a small quantity of tincture of capsicum would be apt to secure free vomiting before relaxation would come on, and this would be a decided advantage to the patient. When the patient has been brought to that point which is commonly known as the "alarm" (that is, a state of general relaxation, in which the perspiration is profuse and the muscular system too relaxed to be capable of motion), the lobelia may be continued in smaller doses and this condition should be maintained for six or twelve hours, according to the probable seriousness of the wound. Those who are unacquainted with the effects of lobelia, will not be likely to ever venture upon the use of enough of it to bring a patient into this condition; those who are familiar with the nature of the article, will know that there is no occasion to fear continuous lobelic relaxation under these circumstances. The profuse sweat carries out the virus more efficiently than can be done in any other way; but the same condition of relaxation also favors a decided increase of renal secretion and pulmonary exhalation, and these combined sources of elimination offer the only possible media for saving the patient's life. When it is deemed advisable to allow the influence of lobelia to pass off, the administration of the tincture is to be stopped and the patient left to recover at his leisure. If, however, he did not vomit before becoming relaxed, it is best to administer small quantities of weak composition tea, or an infusion of zinziber, myrica and cypripedium, in equal quantities. Free emesis is thus secured; and, if the patient is now moderately bathed in a vapor bath and plied with polemonium, macrotrys, asarum, scutellaria or aristolochia, a cure will be effected and the system saved from the virus, if such ends are possible.

Perhaps a still more efficient mode of management would be, to place the patient upon a cot and administer the vapor bath at a very moderate temperature, at the same time giving the third preparation of lobelia to secure prompt vomiting and hasten relaxation. There is scarcely time, however, to prepare such a bath, and the first mentioned course must be pursued with all due vigor till vapor can be raised, and then the bath may be used to expedite the relaxing influence of the lobelia.

In the meantime, the sore itself must be attended to. Poultices of lobelia seeds and capsicum, mixed in small quantities of ulmus, are the best applications that can be made. They should be large, applied warm and frequently wetted with the third preparation of lobelia. The poultices may be extended along the whole limb, or around the whole body when the bite has been inflicted upon the trunk.

Some of our practitioners place dependence upon the use of such nervines as macrotrys, polemonium, eupatorium ageratoides, plantago major, scutellaria, cypripedium and leontice thalictroides. All these agents exert a marked influence upon the nervous system and most of them influence the skin and mucous membranes. The macrotrys, polemonium and scutellaria, are especially valuable and there are many well attested cases on record in which the free use of these, either alone or aided by the vapor bath, has been efficient in relieving bites of the rattlesnake and copperhead. While, however, we must give due credit to the value of those agents in these and all other cases of poisoning, it can scarcely be proper to consider them equal to the cure of severe snake bites. They may be used to great advantage, but the main reliance should be placed in the vapor baths and relaxation by lobelia—to which the nervines hold an important auxilliary relation. The several species of plantain are undoubtedly good ingredients to incorporate with the poultices.

Bites of Rabid Dogs—Hydrophobia.—Hydrophobia literally means a "dread of water," but has been applied to that association of convulsive symptoms which follows the introduction of a specific poison from a dog or other animal, among which symptoms spasmodic (but futile) attempts at deglutition are prominent. It never occurs spontaneously in man, but arises in dogs, wolves and other animals of that class, without any known specific cause, and is conveyed by them to any other living being that they may bite or to any sore that they may lick. When conveyed from one animal to another, it can be again propagated by the recipient of the virus; and there are pretty certain evidences that human beings can convey it to one another, but more particularly to an animal of a lower order than themselves, although this fact has been strongly doubted.

Dogs seem to be most liable to this affection during the hot months of summer and an insufficient supply of water and food is supposed to be the main provoking cause, begetting a vitiated state of the blood that soon infects the whole system and ripens into a specific poison. The want of couch grass and a deprivation of sexual intercourse have also been considered as provoking causes. Erichsen refers to Eckel as presenting statistics to show that bitches are not as often affected as dogs, mongrels are more frequently affected than pure breeds and the malady very seldom occurs in dogs that have been castrated.

Rabies in the dog is generally preceded by a train of suspicious symptoms which, if properly watched, may assist the detection of its approach and enable us to take the animal's life in time to prevent a conveyance of the poison to human beings. The following quotations from Mr. Youatt's Treatise on the Dog (p. 204–209) are sufficiently descriptive of these symptoms:

"In the greater number of cases, these are sullenness, fidgetiness and continual shifting of posture. * * For several consecutive hours, perhaps, he retreats to his basket or his bed. He shows no disposition to bite and he answers the call upon him laggardly. He is curled up and his face is burried between his paws and his breast. At length he begins to be fidgety. He searches out new resting places; but he very soon changes them for others. He takes again to his own bed; but is continually changing his posture. * His countenance is clouded and suspicious. * * A peculiar delirium is an early symptom. * * I have again and again seen the rabid dog start up, after a momentary quietude, with unmingled ferocity depicted on his countenance, and plunge with a savage howl to the end of his chain. At other times he would stop and watch the nails in the partition of the stable in which he was confined, and, fancying them to move, he would dart at them. * * Whether he is watching the motes that are floating in the air or the insects that are annoying him on the walls or the foes that he fancies are threatening him on every side, one word recalls him in a moment. Dispersed by the magic influence of his master's voice, every object of terror disappears and he crawls toward him with the same peculiar expression of attachment that used to characterize him. * * The dog rubs his ear against every projecting body; he scratches it might and main and tumbles over and over while he is thus employed. * * Some dogs vomit once or twice in the early period of the disease; when this happens, they never return to the natural food of the dog, but are eager for everything that is filthy and horrible."

Dryness of the fauces, insatiate thirst and constant lapping of water, as long as he is able to move the jaws; then a discharge of viscid saliva and a disposition to bite every thing and every body, mark the more advanced stages of the malady. The poison may be conveyed from the dog to other animals, or to men, before the frothy saliva appears. This occurs, sometimes, when the master suffers the rabid animal to lick any sore or scratch upon him. Most cases of hydrophobia, however, arise from direct inoculation by a bite during the period of salivation. Wounds upon the open surface are most dangerous; those inflicted through the clothing are least so, as much or all of the poison may be then wiped from the animal's fangs before they reach the flesh.

SYMPTOMS—IN MAN.—The symptoms of hydrophobia seldom appear till the lapse of a few weeks after the bite by the rabid animal; generally, five or eight weeks pass by before any unpleasantness is felt—the wound in the meantime healing up naturally and the health remaining ordinarily good. In some instances, the virus has remained for several months in the system before provoking any unpleasant manifestations; and some authors have adduced cases (of a rather suspicious character) to prove that death may take place from canine madness five or seven years after the infliction of the bite of a rabid animal. In all cases, however, some time passes before the patient becomes aware that he is not usually well. The first monition of impending danger is a dull, heavy pain, soon followed by a stinging sensation and slight swelling at the site of the original wound. The part may become red, remain of its natural color or break into a deep, foul ulcer; pain of a rheumatic character extends along the course of the nerves, toward the heart, and may or may not be accompanied by slight redness upon the skin. In some cases, there is numbness, rather than pain, along the nerves and sometimes the pain and uneasiness are not present. In the course of a day or two, the patient feels slightly unwell, complains of trifling alternations of chilliness and heat, has a little head-ache and is rather peevish, downcast and indisposed to exertion. These symptoms gradually increase for four or five days, the head becoming giddy, the pulse ardent but remitting, the stomach irritable, sleep disturbed and the senses extremely active. Shortly, the neck becomes stiff, swallowing is performed with difficulty, respiration is laborious and then the pathognomonic ysmptoms of hydrophoiba soon declare themselves.

An utter inability to swallow fluids is the chief peculiarity of this fearful malady. This inability has been improperly attributed to the fear of liquids; but the truth in the matter is, that there is an inordinate thirst and insatiable desire to drink; but the very sight or sound of fluids excites convulsions and contracts the muscles of the pharynx and larynx, thus wholly preventing the act of swallowing. The spasms are at first light (being excited only at the sight of liquids) and extend no further than the muscles of deglutition. In a little time the muscles of respiration are involved and breathing is performed laboriously and by snatches—the diaphragm contracting spasmodically and causing a sharp pain at the pit of the stomach. Finally, the excitement produced at the thought of water is so great, that the whole body may be thrown into violent agitation at the very sound of it or even at the sight of a drinking vessel. Yet the patient's desire for drink is perfectly maniacal and he may make the most intense struggles to carry a cup to his lips and swallow a few drops of the longed-for beverage. But all such attempts prove unavailing—the patient gets no water, is excited to renewed spasms by the attempts, ends his effort by a stare or cry of disappointment and casts from his mouth viscid saliva in the form of froth.

During all this time, the patient has been aware of the nature of his malady and his mind settles into a fixed despondency. A sense of dread and a perfect feeling of horror seize upon him and spectral illusions are by no means uncommon. The days and nights are passed without sleep; all the senses, particularly that of touch, are remarkably sensitive; the eyes are pained by even an ordinary light and the most trifling sound will excite the patient out of all propriety and may even serve to provoke convulsions; the sputæ become thicker and more viscid and the breathing is spasmodic and not unfrequently accompanied by a sharp, rattling noise in the throat. The mind gradually loses its self-control and the patient either remains sullen or talks incessantly between his convulsive paroxysms. In some instances, fits of frenzy alternate with rationality. The eyes become staring and bloodshot and do not shut, even for a moment; the countenance is haggard; the convulsions become more and more incessant and cause sharp pain; and the struggles for breath ultimately become frightful. The patient finally dies in the midst of one of his fearful paroxysms; or he may have a paroxysm, enjoy a few moments repose and then die quietly from sheer exhaustion.

TREATMENT.—The appalling nature of hydrophobia, the almost invariable regularity with which it ends in death and the assertion of every acknowledged Allopathic authority that it never has been and never can be cured, conspire to render it one of the most undesirable forms of disease to which the physician or surgeon can be called to administer. Indeed, hydrophobic patients are usually considered as good as dead, and but little is now attempted for their benefit except to cut out the old cicatrix after the poison has fermented through the system, or smother the sufferer between feather beds in order to cut short his misery. Very fortunately, however, these notions and practices are all wrong: the proper plan of management for these cases has been found and tried and the results have been highly encouraging. It now remains for all classes of practitioners to adopt it, when much of the popular terror of canine madness will be quieted and many a victim saved from an untimely grave.

The indications are, in all respects, the same as those in tetanus and snake-bites. The system must be relaxed by lobelia exhibited (per rectum) in large quantities, and by the cot vapor bath applied at a low temperature and for any length of time that may be required to bring the patient to an easy condition. When these means have loosened the structures and relieved the spasmodic twitchings of the muscles, a free lobelia emetic should be given and followed by drinks of scutellaria, cypripedium or other nervine. These emetics and baths should be repeated every time there is a tendency to a recurrence of the convulsions, even if this should be at intervals of six hours. If the patient can not drink, lobelia seeds should be given by enema and the vapor bath repeated till swallowing is made possible, and then the emetics and nervine drinks are to be administered as before. The treatment must be very energetic and the extreme tension of the nervous and muscular systems will demand an almost incalculable amount of lobelia to relax them (see p. 313).

The sameness of this treatment with that for tetanus and snake bites might be considered as an evidence that it is inefficient; for three forms of disease so dissimilar in their symptoms might be considered unrelievable by the same general means. A careful consideration of the question, however, will show that the dissimilarity is but trifling and the treatment in every way appropriate to the ends that are to be accomplished. Hydrophobia is provoked by a virus, but the nature of that virus and the peculiar points wherein it differs from the viri of serpents have not been determined. Whatever speculations may have been advanced upon the subject, all authors have recognized the practical fact that the elimination of the hydrophobic poison from the system offers the principal measure of safety. 'As this elimination can be effected only through and by the natural excretory organs of the frame, it indisputably follows, that whatever course of management will open the emunctories most promptly, naturally and thoroughly, will be most efficient in casting out the virus and relieving the body from its thraldom. Experience has abundantly proved that vapor baths, relaxation by lobelia, emetics of the same agent and drinks of the diffusive nervines, are unequaled in their power to depurate the system of all and every morbific material that may have been lodged in it, at the same time sustaining the vigor of the nerves and subjecting no part of the organism to violence or injury. It follows, therefore, that this treatment is directly calculated to remove hydrophobic poison.

Besides, the presence of this virus provokes extreme tension of the nervous system (as evinced in the undue keenness of the senses) and violent clonic spasms of the muscular apparatus. These conditions, like similar conditions in tetanus, can be relieved only by complete and thorough relaxation; and no means have ever yet been discovered that will accomplish this so effectually and safely as will lobelia and the vapor bath. Further, the vapor bath (besides being one of the most powerful depurators known to man) invites a free flow of blood outwardly, thus relieving that pressure upon the cerebrum and medulla oblongata which is the immediate exciting cause of the convulsions, sensitiveness and delirium.

Logic alone, however, need not be depended upon to prove the philosophical propriety of this mode of management; for the measures and the medicines have been tested for a series of years and have proved remarkably efficacious. There are a number of properly attested cases on record in which both incipient and confirmed hydrophobia has been cured by the course of management above recommended. We have ourselves known a case in which the continued use of strong lobelia enemas and then infusions and a maintenance of the state of "alarm" for a period of seventy-two consecutive hours, effectually cured a man who had arrived at a point where he could not swallow before the agent was employed. M. Boisson, of France, reported sixteen confirmed cases that he treated and permanently cured by the vapor bath alone. Surely, there are enough facts to prove that this mode of medication is likely to be efficient in many, if not in most, cases in which it can be early and thoroughly applied. It is not probable that it will cure every hydrophobic patient, for that may be properly enumerated among the impossibilities of medical science; but enough has been already done by the method above directed to show its adaptedness to, and power over, this dreadful malady and to entitle it to the respect and confidence of all branches of the medical profession.

severe, stinging pain and a determination of blood that gives a bright redness without any infiltration of serum or any material swelling. These symptoms usually abate after a few days, and do not require treatment on account of any seriousness connected with them, but because of the unpleasant pain they occasion. It may be remarked, however, that a simple burn or scald, extending over a large surface, *may* cause serious collapse.

A great variety of means may be used to allay the smarting of these accidents. We are partial to cold water applications, plunging the part immediately into a basin or tub full. It abstracts the heat at once and, by continuing the application, wrapping the part up and irrigating it freely, the pain will be relieved and no further injury follow. We have treated many considerable burns in this way, saving the integuments and easing the patient in a few hours, when there was every reason to believe that the injury was great enough to have otherwise led to abrasions and vesications. The application of some of the lighter oils over the surface is also valuable. Goose and olive oils are the best for these purposes. They may be smeared upon linen and used without any other dressing, though a preferable way is to apply them after the cold water bathings have relieved the extreme smarting, continuing the water irrigation in connection with the oils. Lime water with any of the oils makes a very soothing wash; and soap liniment (sweet oil and ammonia) has long been in deserved repute. A good lather from castile soap gives relief; spirits of turpentine are applied by some, though many other agents are far better; ointment of sambucus, celastrus, erigeron, rumex and similar agents, may be applied at pleasure. A few days suffice to restore the nerves to their natural ease.

Vesicating Injuries from Heat.

In this class, the injury is sufficient to nearly destroy the skin, so that the cuticle will either rub off immediately and leave the cutis vera exposed or an exudation of serum will take place underneath, raising the cuticle, and even the entire integument, into blisters of greater or less size. The determination of blood to the parts will be much greater than in [illegible] former class of cases; the pain will be much greater and
d, and there will also be more swelling. It is
the whole body to sympathize with acci-
more or less ardent febrile recuperative

effort being set up. Scalds cause this grade of injury more frequently than actual burns, which are likely to produce an eschar when the offending solid is sufficiently heated to do so much mischief.

When the vesicles break, or if the cutis vera is denuded and damaged immediately, the case becomes an ulcer and is usually of the simple kind, granulating without much difficulty. Yet, in persons of feeble frame, in those of disturbed health and in puny children, there may not be sufficient vital power to heal up the sore readily, when it may degenerate and will usually pass into the irritable ulcer, rarely into the weak ulcer. When this occurs, the case will be apt to prove a tedious one—ulcers resulting from accidents by heat being very intractable.

TREATMENT.—The management of this grade (when the skin is unbroken, but in vesicles) may be much the same as in the former cases. Carefully puncture the vesicles and empty them (allowing no air to get in and pressing the cuticle down nicely). Cold water compresses, oils, oil and lime water and similar appliances, will then relieve the pain and abstract the excess of heat. But when the vesicles have been ruptured or the cuticle destroyed by the injury, more active treatment will be required. If there is a healthy and granulating surface, elm or mallows poultice may be applied; or, still better, a gluten, made by decoction of either of these articles, may be incorporated with finely scraped lint and laid over the part. Irish moss and flaxseed may be used for the same purpose. Such applications require to be changed every eight or twelve hours. We are partial to these demulcents, as they are both cooling and lubricating and prevent that contraction during cicatrization which is to be so carefully guarded against in all burns and scalds and especially in those occurring on the face, neck and fingers. A paste, made by rubbing prepared chalk with sweet oil, forms an excellent dressing; or finely powdered chalk may be dusted on and oil or mucilage spread over it. Fine ulmus is also used for the same purpose. Great cleanliness is to be observed and the clothing must *always* be light and well supported from the part.

But if the sore should pass into a more degenerate condition, the simply lubricating agents will not be sufficient and relaxants and stimulants, of various degrees and in various proportions, will become requisite. The case will then belong to one of the classes of ulcers and will call for that management which has already been directed for the various sores (see *Ulceration*). In burns and scalds, however, the greatest care must be taken to prevent too great contraction of the parts in cicatrizing. Thus, if the injury is located between the fingers, about the neck or near the eyes, the most unpleasant deformity may be given by binding the parts together during the healing process. The constant use of lubricants (as above directed), together with the maintenance of a proper position, will prevent such occurrences.

The practitioner is not to forget the general health in accidents of this grade. He may find foulness of the stomach, costiveness and other functional derangements, which will call for assistance by emetics, enemas, sudorifics, tonics, &c. No point is to be left unguarded, in this respect, for the healing of the sore will be greatly protracted, even if the general health should not suffer, by such neglects. The system must have every aid that can be rendered it, in order that it may accomplish the work of reparation more readily and properly. A repetition of these means is unnecessary at this point, as they have been already considered pretty fully in the sections upon ulcers and will be again mentioned under the next class of burns and scalds.

Deep Injuries from Heat.

In this class of these accidents, the skin and subjacent integuments are at once reduced to an eschar; or the tissues are deeply destroyed, and not formed into an eschar, by the continued application of molten metals, boiling oils, steam or other intensely heated fluid. The sloughs are ultimately removed by the ordinary process of ulceration and the injury healed by granulation. Recovery, however, is usually tardy, and many untoward accidents may occur to jeopardize the patient's life, besides protracting the healing process. These are mainly of a constitutional character and may be mentioned under the following heads:

1st. *Collapse.*—The injury is so great and the shock to the nervous system so considerable, that the patient usually suffers a deep and lengthy collapse. The blood recedes from the surface, leaving it pale, cold and flabby; the heart and larger arteries become over crowded and perform their labor with the greatest difficulty—the pulse being feeble, soft and flickering; the lungs are very much engorged, giving heavy and even stertorous breathing; the brain is similarly oppressed, leading to a greater or less degree of coma; the secretions are suppressed or else involuntarily performed. This collapse may occur almost at the moment of the injury; or the patient may seem to be unshocked by the accident, remain some hours in a comparatively comfortable condition, *with an almost insensible condition of the damaged parts,* and then suddenly sink. Whether momentary or transiently delayed, the collapse may lead to direct death—the labored respiration, coma and flickering pulse, showing the danger to consist in engorgement of the three great vital centers. Sometimes death takes place within a few hours; again it may be deferred for some days. When the patient does recover from this state, the next danger is that during reaction.

2d. *Reaction.*—This consists in the violent arousing of the heart and arteries, by which the blood is returned to the surface and extremities with most unusual vigor, constituting a full febrile effort. It may take place any time between the first and twelfth day after the accident, according to the degree of despoliation. Usually from the third to the fifth day is the period in which it occurs; and recovery is scarcely to be anticipated if nature, even when unassisted, can not establish reaction within this time. The reaction differs very much in degree, according to the constitution and health of the patient—varying in ardor from the most earnest or inflammatory to the most feeble or typhoid. Of course, the student understands that there is no danger to be apprehended from the reaction itself, which is a febrile effort *designed* for the benefit of the system and the reparation of the injury, as has been already shown to be the case with fever under all circumstances. The difficulty consists either in the fact that the system may have been so prostrated by the shock as to be incapable of making a febrile effort strong enough to restore the lost balance and cast off the eschar; or, the reaction may be so opposed by previous ill health and morbific accumulations, together with the depression of the shock, as to fail in accomplishing the ends required of it. From either of these causes the patient may die during the vital effort to resist disease and establish recuperative action.

3d. *Drain of Suppuration.*—If the febrile exertion should succeed in restoring the blood to its natural channels, a third danger awaits the patient in the form of exhaustion consequent upon excessive purulent discharge. The strength of the system having been so much reduced by the shock and the whole body depressed by the injury, a hearty granulating effort can not now be carried on. Thus, the reaction is more likely to be of a feeble than of an ardent or sthenic grade; the slough is removed slowly; granulation is tardy in beginning, and the plastic exudations are of so weak a character that they can not be molded into sound tissue, but pass away in the form of purulent liquefaction; sometimes large fungous excrescences are formed, which require to be removed by caustic; and a little surgical neglect may allow the ulcer to become a sloughing sore, enlarging its limits rather than narrowing them. In this way the ulcer may remain almost stationary, only the most trifling attempts being made to heal it, and weeks or months pass away without the deposition of a single layer of good structure. This, although a consequence of the constitutional injury suffered, in turn reacts upon the frame, causing extreme exhaustion, leading to hectic and threating the patient's life.

It is only in cases which have been most grossly neglected or bunglingly treated, that the dangers of the second and third classes prove of much consequence. In the hands of the Physio-Medical surgeon, where the management presently to be mentioned is properly carried out, grave results follow only from the very severest degrees of these accidents, and then almost always in the state of collapse; for, if the vital force has still enough hold upon the system to establish reaction, the aid his means will render it are usually sufficient to save life. Yet it is well for the attendant to keep all these dangers in view, that a full appreciation of the hazards and liabilities of such cases may not allow him to become careless at any stage of the accident or waste a patient's health by over confidence, even in that which is good.

A very unpleasant, if not serious, accompaniment of some of these deep burns and scalds, are convulsions. These may be either general or partial. They result from reflection of the irritation at the injured surface, which is perhaps aided by the reflection of an existing irritation of the prima via. Sometimes these spasmodic manifestations do not occur till after the process of granulation has been fairly established (and that, too, for some time), when they will appear suddenly and with great severity. In such instances, the convulsions are likely to be wholly traceable to alvine excitation in an enfeebled frame.

TREATMENT.—The first care should be to protect the injured parts from the air by wrapping them in cloths smeared with some oily or mucilaginous substance. Fine charpie, dipped in sweet oil and laid on and a layer or two of muslin gently wrapped over this, will be found as good an application as any, and may be allowed to remain undisturbed for some hours. If these materials are not at hand, cloths thoroughly saturated with linseed oil, lard or a good jelly from the bark of ulmus, may be substituted. This having been done and the patient put to bed, every effort must be made to rouse him from the state of collapse, or anticipate that state if it should not have occurred. Comfortably warm clothing, stimulating teas, stimulating enemas and similar means, must be employed thoroughly, in the manner which has been already mentioned in the section upon *Shock of Injury*. These means are necessary to restore the flow of blood to the surface and arouse the nerves from their condition of depression, otherwise the patient will sink to a point that will render final reaction very doubtful; and, in the mean time, there may be sanguineous extravasation upon the lungs and brain, which will greatly endanger life. No apprehensions need be felt in obtaining a vigorous reaction; for the more earnest the subsequent arterial effort, the greater will be the probabilities that the life power will be able to overcome the disease; while the longer the period of reaction is delayed, the more feeble will be the recuperative exertion. Let the practitioner labor ardently, therefore, to re-establish an equilibrium in the circulation, nor cease his efforts till they have either succeeded or failed in death. Should the shock be of that character known as insidious, the same means must be used to arouse the functions of the nervous and circulatory apparatus, though the prospect of succeeding is very doubtful. As soon as reaction comes on, its intentions must be so seconded that the vital power may not be required to exhaust the tissues by desperate efforts to cast off morbific material and establish an even flow through the system. The diffusive relaxants must be then presented, using them in the form of warm infusion and giving them freely. As the grade of action is likely, under the inducement of the stimulants given during collapse, to be of the sthenic or inflammatory type, the course of treatment recommended on pages 61–64 must be at once put on foot. Salvia, mentha, asclepias, collinsonia and lobelia, by infusion; enemas of such demulcents and relaxants as will best keep the bowels in a soluble condition; galium and arctium lappa seeds, when the kidneys are too inactive; and emetics, when a foul tongue and an aching head show a bad stomach. Such is the plan to be vigorously followed under these circumstances, and by which the greatest ease will be given to the arterial tension and the impurities of the system most speedily cast out. But if the reaction should be of a feeble quality, coming under what is known as the *Typhoid Grade of Fever*, the management recommended on pages 67–71 must be pursued. Zinziber, asarum, polemonium and aristolochia, either alone or combined with some relaxant, must be given largely in *weak* infusion. Capsicum rarely becomes necessary at first, but is often needed after the burst of reaction has passed over. Costiveness must be removed by appropriate injections of a relaxing and stimulating character, and by small portions of leptandra and juglans when needed; diarrhea is to be checked by astringing and stimulating enemas of a strength fitted to the necessities of the case. If there should be much irritability, the nervines must be used plentifully, as asarum, mentha and lavandula, or the third preparation of lobelia. Every care must be taken to save the strength of the patient, and the utmost freedom must be allowed for the escape of anything within the system that can possibly prove detrimental to it. And here we may mention that all noise and talking must be prohibited about the patient. The sympathy of neighbors incline them to visit the family thus accidentally afflicted, and many times their presence proves very injurious to the mind and nervous system of the sufferer. The practitioner can not be too positive in insisting upon perfect quiet.

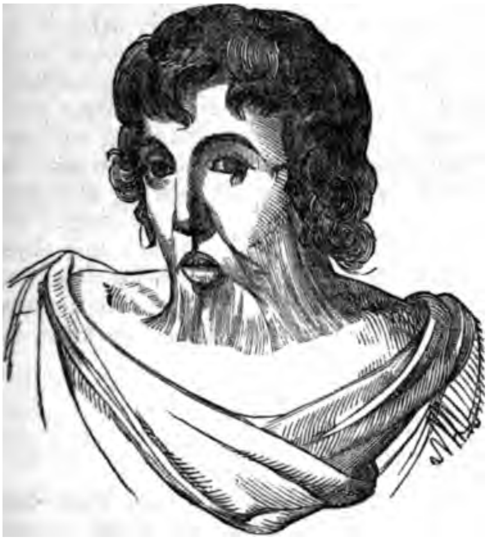
Upon the commencement of reaction (or before, if efforts to bring this about are not successful within twenty-four hours) the envelops in which the injured parts were first wrapped may be removed and new dressings applied. All loose eschars must be first carefully removed, any portions that are not perfectly destroyed being softly adjusted over the parts underneath, to which they will form the best protection. The scissors and the knife may be required to remove some points, but it is unsurgical to denude any living portion in these attempts. The surfaces having been cleaned in this way, the paste of sweet oil and chalk, before spoken of, will make one of the best applications during the hight of reaction. It should be smeared thickly over the sore, and then charpie, saturated with the same, laid upon the part and a light compress wrapped about the whole; or, a thin plaster, made of beeswax, suet and oil, may be spread upon fine linen and adjusted to the surface of the injury, making a most useful application, both soothing and protecting the parts and favoring the proper removal of the sloughs. The sores may be thus dressed every twelve or twenty-four hours, as may be thought best, being carefully washed and cleansed each time, no pressure or rubbing being used in this operation; or, poultices of ulmus, linum or other demulcents, mixed with lobelia, baptisia or some proper relaxant, is a favorite mode with many. Very small proportions of zinziber may be added to such poultices when there is a loss of sensibility in the parts, or they may be washed with diluted compound tincture of myrrh when the insensibility is considerable. The articles that may be selected for the purposes of poultice are numerous, and the practice of their application is a most excellent one—though they should *always* be thin, besides containing stimulants when there is the least danger of gangrene. All poultices should be applied warm, and the injured parts carefully kept from becoming the least chilly, to which they are very much inclined.

The period of reaction may last from one to twelve days, according to the amount of morbific materials to be cast from the system, the extent of surface over which granulation has to be established, and the assistance that has been rendered to the vital force by the practitioner. If the frame is not properly supported and the life-power meets with too great a task, the patient is apt to sink into a feeble condition, to which the term exhaustion applies better than any other. It should be the care of the attendant to keep the patient from this, by supporting him with tonics and good diet as soon as the burst of reaction seems to have passed over. Hydrastis, populus, sabbatia, aletris and similar bitters, must be used constantly; capsicum may be added when a too frequent and flickering pulse shows the need of stimulants; and zinziber and other diffusives of its kind drank pretty freely. Such a course as this must be pursued constantly and vigorously till convalescence, the patient needing strengthening and supporting all the way through. Any secretion that may be stopped must be at once restored by the appropriate means; the least foulness of the tongue must be promptly met by an emetic of the stimulating character. The proper pursuit of these measures will maintain that lively action in the system which is so absolutely necessary in severe burns and scalds and without which no local treatment can be of any permanent benefit.

The sore itself now belongs to one or the other of the varieties of ulcer, and is to be managed according to the class with which it is affiliated. If it is free from pain, has a discharge of healthy pus, is accompanied by a moderate grade of inflammation and shows good granules, it is a case of *simple* sore, best managed by thin elm and lobelia poultices smeared with some soft oil. If the discharge is considerable and of an unwholesome odor, the sloughs not coming away readily, the purple of congestion surrounding the part and the granules being pale, it is a *weak* sore, requiring such mild stimulants as zinziber and aristolochia in the poultices as well as in the constitutional treatment. In this manner is the practitioner to judge of its character, and then class it and treat it as has been already fully directed under the head of *Ulceration*, being most likely to find it fluctuating between the *weak* and the *simple* sore, occasionally becoming *irritable*. The sloughs are to be very carefully cut away as they become loosened, no violence to a single thread of living tissue being ever allowed. If fungus should arise, as it may sometimes do at points, a sprinkling of burnt alum will be sufficient for its removal, though powder of sanguinaria, or light touches of vegetable caustic may be employed for the same purpose.

If convulsions should occur, the alimentary canal must be immediately relieved by enemas of lobelia and the third preparation of lobelia given in small and frequent doses. It is not often that more than an hour or two will be required to soothe the system and restore quiet.

FIG. 22.



Deformity from a Burn.

The amount of tissue which has to be filled up, in burns of this grade, is so great that the cicatrices are very likely to be dense and hard, and may so contract the surface as to lead to great deformity. Thus, if the injury is about the neck, the bosom and chin may be united as with a web of cartilage. So the fingers of the hand may be tied together, the arm may be bound to the side, the thighs drawn toward the abdomen and the genitals most uncomfortably attached to some neighboring part. Every care must be taken by the surgeon to prevent such results as far as possible, lest they should be disreputably accredited to his ignorance or carelessness. The position chosen must be that which rather stretches the parts from each other, and they must be most thoroughly lubricated during the whole process of healing. The poultices must be made to fill deeply into the angles. Goose, hen and rattlesnake, among the animal oils, and flaxseed, among the vegetable, are the most softening, and must be applied constantly and freely. When unsightly deformities occur, they may be remedied by plastic operations.

CHAPTER V.

INJURIES BY COLD.

General Remarks.

LONG exposures to considerable degrees of cold injure the body by abstracting too much vital warmth, impeding the circulation and weakening the capillaries and lesser arteries to such a degree that they may become partially or wholly unable to maintain the nourishment of the exposed portions. A small part, or the whole, of the body may be thus injured; and the degrees to which it may be affected and the amount of cold it will endure, at different times and under different circumstances, will vary greatly. The lower extremities, the upper extremities, the nose and the ears (being most remote from the circulatory center), are most frequently injured by frost. The chilliness and retardation begin at some such point with an intensely stinging pain and thence gradually extend toward the trunk—the pain entirely subsiding in a short time and the work of devastation advancing without any warning from the benumbed nerves. The frame may be fatally injured by exposure to cold without having any portion of the tissues or fluids actually frozen or congealed, which is termed an *indirect* injury. Or the tissues and their fluids may be frozen to stiffness, when it is called a *direct* injury. The latter class of cases is most common, the former most serious. It will make the subject plainer to treat of these separately rather than together.

Local Indirect Injuries from Cold.

When any part is long exposed to sharp cold and then suddenly brought to a warm place, the ebb of blood caused by the former is followed by an undue flow induced by the latter. Engorgement and turgescence result; the part is of a heavy red, inclining to a dark purple color; it stings intolerably and is much more sensitive to heat and cold than it was before. It may remain in this condition for some time, the tissues recovering their strength and the inflammation subsiding gradually. But at times the skin cracks open in irregular fissures, forming ulcers of a low character, from which flows a watery discharge of an ichorous quality. The parts are very tender, but the ulcers are rarely more than skin deep and are not apt to extend beyond the limits of the original fissures.

This degree of injury is popularly known as *chilblain.* It afflicts the feet, hands and nose, oftener than any other portion of the body. There is no danger connected with it, the stinging pain and the intolerable itching and tenderness being the only inconveniences attending it.

TREATMENT.—All persons are liable to have chilblains after sudden and extreme changes of temperature, hence all should be prudent in bringing themselves too suddenly into a heated room after having been exposed to considerable cold. Gentle, dry friction of the parts, in a room of a very moderate temperature, will enable the tissues to regain their strength and warmth, when the individual can go to a warmer place with impunity. When the chilblains exist, they may be frequently bathed with acetic tincture of capsicum diluted with water, or with tincture of myrrh, xanthoxylum or almost any other stimulant. If ulcers form, they are likely to be very irritable at first and then pass into an indolent condition. Poultices of ulmus and cimicifuga, previously smeared with some light oil, may be applied while the excitement of irritation lasts, any signs of threatening congestion being promptly met by the addition of small portions of zinziber. When the ulcers become indolent, stimulating washes may be again resorted to, the parts being dressed, between the applications, with ointment of sambucus, rumex or baptisia.

General Indirect Injuries from Cold.

The whole frame may suffer intensely by cold, without becoming actually frozen. The heat of the body is gradually lowered, the blood still circulates and no part becomes rigid. Yet the tissues are greatly weakened by the abstraction of warmth. In this state, the individual is inclined to hurry to the warmest apartment he can find, being also likely to try to warm himself by throwing his arms about, by walking or by using friction to those parts of the surface which feel most uncomfortable. As a consequence, the blood rushes freely to the skin, the weakened vessels give way before the pressure and a densely crowded condition results. Against this pressure the tissues can not act vigorously, having been too much enfeebled by the previous exposure. An inflammatory action will be attempted and will probably be so far successful over the greater portion of the surface, as to place the whole skin in the condition of one great chilblain, with characteristic stinging and redness. But the parts most remote from the center of circulation may not be able to establish an inflammation, congestion takes place, the heat softens the tissues and the skin speedily becomes gangrenous and sloughs away. As the patient has to be confined to bed, the pressure of the body may again cut off the weak circulation about the points of pressure and bed-sores be formed. The general health of the individual is also liable to fail, the pulse becoming thready and soft, the appetite precarious, the mind listless and the whole body evidently passing into a condition of great debility.

Life may be suddenly destroyed by exposures of this kind, the depression from cold being long continued and deep and the reaction from warmth (perhaps aided by internal stimulants) sudden and great. Under such circumstances, the structures are found incapable of at all sustaining the circulation and, to use the words of Baron Larrey, "gangrene * * spread with such rapidity that its advances were perceptible to the naked eye." The same author continues, describing the results of the exposures to the intense cold at the battle of Eylau: "Or the individual was suddenly suffocated with a kind of turgescence, which appeared to affect the brain and lungs; he perished as in asphyxia. Thus died the chief apothecary of the guards. * He had scarcely been a few hours in this (warm) atmosphere, so new to him, when his limbs, in which he had lost all feeling, became considerably swelled; and he expired soon afterward, incapable of uttering a single word" (Larrey's Memoirs, tom. iv, page 134). Such degrees of injury are scarcely ever met with in our country, it being very seldom that persons are forced to be exposed for so long a time to such a degree of cold.

The point of Fahrenheit at which injuries of this grade may result, will differ very much with different individuals and under different circumstances. With persons in health (natives of the temperate zone), ten degrees below zero is considered necessary to induce such extents of mischief. Yet those who have been prostrated by previous sickness, or made tender by housing themselves too closely during winter, or weakened by insufficient food and those who are too thinly clad or are placed in cramping positions, may be affected to this degree when the thermometer stands above zero and even when it is but a little below the freezing point. Persons, also, who have indulged in alcoholic drinks, are much more liable to suffer than those who have not, experience conclusively proving that such beverages quite unfit one for resistance to intense cold—popular opinion to the contrary, notwithstanding.

TREATMENT.—The greatest care must be taken to not bring persons thus exposed into a warm apartment. They must be placed in a room without fire, covered lightly and then have dry friction gradually and gently applied over the whole surface. This course gives the tissues an opportunity to regain their strength, the blood will be prevented from flowing too immoderately to the surface and the equilibrium of the circulation will be restored by such slow degrees that stagnation will not be liable to take place. From one to four days may be required for this purpose, according to the extent to which the patient has been chilled. If he complains of feeling cold, more covering may be carefully added; but the temperature underneath the bedding should not be allowed to get above forty or fifty degrees of Fahrenheit, till returning naturalness demands a warmer atmosphere, and it is generally best to keep the air around the body almost at the freezing point for the first twenty-four hours. In Russia and Siberia it is customary to rub such patients all over with some animal oil before thus putting them to bed. In our own country it is popular to rub them well with snow and then dry them and confine them to a cold room. The snow seems quite unnecessary in this class of injuries—proper management of the cold room and bed clothing being sufficient to avert unpleasant consequences.

In addition to these precautions, the patient must be denied all articles of a stimulating character, the food being of a plain kind and none but simple drinks being allowed. It is improper to give any such articles as ginger, cayenne and ammonia, for they all tend to force the blood hurriedly to the surface, while it is the practitioner's great aim to allow it to return there but slowly. Yet, if the patient is evidently sinking, the stimulants may be given with propriety, though powder or cold infusion is preferable to the use of warm infusions. Threatening depression may be generally averted by two grain doses of capsicum, in powder, every sixth, fourth or second hour; actual depression may be aroused by small doses of third preparation of lobelia, or aristolochia in powder, every half hour or hour.

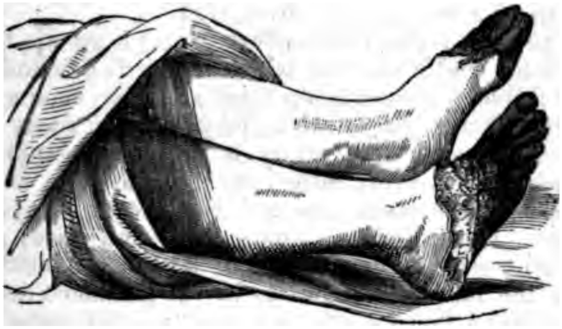
If reaction has set in and the enfeebled tissues are threatened with gangrenous destruction, a different course must be followed. A free use of relaxing stimulants must then be resorted to, and weak infusions of zinziber, aristolochia, eupatorium ageratoides or capsicum, may be given, that the circulatory apparatus may be amply sustained and congestions prevented as far as possible. No good whatever can by attempts to restrain the reactive effort, which aided promptly—the general strength being at the sa supported by such tonics as hydrastis, gentiana and At those points where gangrene appears first, ca myrrh, xanthoxylum or other powerful stimulants, used for a wash, no poultices or emollients being Fomentations of polygonum, marrubium or absinth admissible, though stimulating applications in the washes or unguents, are far better. If any portio tissues sloughs away, the sore underneath is to be dr cording to the character of the ulcer to which it may Usually it is of the *irritable* character, requiring such dressings as ointment of sambucus, celastrus, nepeta tellaria. If it passes into the *indolent* form, gently ing poultices may be used, as has been directed un head. Bandaging is not applicable, as the blood ve too feeble to withstand the least pressure. Tonics, ous diet, careful attention to all the secretions, mi baths occasionally and emetics whenever they are i will then complete the cure. Much time and pat necessary; for such injuries heal slowly.

Injuries from Direct Cold.

This class of these accidents is much more nume the one last considered. The parts become pale, and insensible. If the exposure is continued, the freezing advances stealthily upon the patient, the nerves giving no warning of the danger and the mi same time sinking into the most irresistible letharg iness. The extremities and the exposed portions a head are most likely to these accidents, the advan toward the trunk.

If the injured parts are suddenly thawed, the these cases is the same as in those last mentioned- destruction. The reaction against the frost-bite and the vessels become much distended by large of blood. But the weakened structures are inc maintaining the round of the circulation, extensi tion takes place, the brownish purple hue of stasi the dark hue of death follows and destruction is plete. Where the injury has not been extensive, tion may be of the mildly gangrenous grade, the ing away in small, superficial sloughs. Actual m may be the result of complete congelation, the whole frosted part being cast off as one slough, which sometimes embraces the very bones. The decay is always rapid and accompanied by an ardent vital effort at reparation. The line of separation is usually distinct and defined at an early hour; granulation begins early, though reparation is likely to progress quite slowly.

FIG. 23.



Mortification from Cold.

TREATMENT.—Great care must be taken to prevent a too sudden reflux of the blood, and the part must be so managed that the circulation shall be restored gradually, that each line of recovered ground may be strengthened as life and heat return. For this purpose, no procedure is better than friction of the injured part with snow, the patient being in a room of a temperature below the freezing point. By this means the heat of the part will be very gradually elevated, and the tissues so gently opened for the ingress of the blood that no further injury than a tingling pain will result; peeling off of the cuticle and establishment of a gentle inflammation following. In order to accomplish these ends, however, the management must be careful and the patient should be kept in a cool room till a full circulation is established. If any considerable portion of the surface has suffered, the same course is to be carried out; and a similar mode of management is to be adopted for the restoration of those who have become comatose from the effects of cold. Be not at all sparing with the snow, employ several assistants to rub it briskly over the whole surface. When the warmth of the skin has returned, wipe the patient softly with dry flannel, put him to bed in a cool room and with light covering over him and give him *small* portions of weak aristolochia or zinziber tea, some powdered capsicum or third preparation of lobelia. Infusions are best, and a half tea-spoonful at a time is enough to begin with—the quantity being increased *very* gradually, till the patient is restored to consciousness and comparative comfort. An enema or two of asarum, zinziber or aristolochia, in elm water, will aid in the return of a free general circulation.

If a systemic recuperative effort (fever) is set up, the practitioner must lend it that aid which its grade demands. If it is rather feeble, the pulse being small and wiry, such aromatics as ginger, polemonium or salvia, may be given freely in weak and warm infusion. No injury is now to be apprehended from reaction, but every means must be used to sustain an open state of the structures and the proper escape of the secretions. If the pulse becomes large and hard, asclepias and mentha may be used, a small portion of inflata being added if the tenseness indicates it. If headache occurs, the bowels may be found costive, when relaxing enemas must be given and doses of leptandra or juglans, if necessary. If the patient seems feeble, no febrile effort being established, support him with a nourishing diet and tonics, as hydrastis or populus. If the pulse becomes weak or intermitting, small doses of capsicum may be employed. Recovery is always tedious and the parts injured will remain tender to the touch, though insensible to cold, for a long time. Hence, care is to be taken of the general health and a light oil or softening ointment should be kept on the sores. The patient should also be kept within doors and guarded against sudden changes of temperature.

If reaction has commenced before the surgeon is called, cold applications can be of no use unless there are still some parts which have not thawed. To them the friction with snow may be employed as above. As the parts in which reaction has come on are liable to either mortification or gangrene, the approach of the destruction will be evinced by the dark color which they assume. It then becomes necessary to expedite the separation by washing the parts with stimulants, as capsicum and xanthoxylum, at the same time giving drinks of aristolochia or zinziber and sustaining the strength by tonics. When the sloughs have passed away, leaving ulcers underneath, granulation is to be aided by the means appropriate to the condition of the sore, as has been already explained in the chapter upon *Ulceration.*

Injury to the extremities is occasionally so severe that amputation may become necessary. Of course this will not be the case where the practitioner has been called in time to apply the snow friction, for even slight sloughing but rarely results from extensive frost-bites where this management can be employed. The knife is to be used only in severe cases and the propriety of resorting to it may be determined by the considerations mentioned on pages 201–202.

CHAPTER VI.

FRACTURES.

Fractures in General.

ALL the bones of the body, but particularly the long bones of the extremities, are liable to break under sudden and severe external violence; and solution of continuity in the osseous structures is an accident of very common occurrence. Aged persons, in whose bones the earthy materials predominate very largely, suffer fractures more frequently than do the middle aged, and the middle aged are in turn more liable to be thus injured than the young, in whose osseous systems the large proportion of cartilaginous material gives a degree of elasticity that effectually provides against forcible ruptures. Men, too, suffer fractures much more frequently than women (a fact readily accounted for by the differences of the pursuits of the two sexes), and those who are sickly, slender, scrofulous, scorbutic or tainted with syphilis, are peculiarly predisposed to injuries of this kind.

Fractures present themselves to the surgeon under an almost endless diversity of circumstances and in numberless forms and varieties. Sometimes there is nothing more than a slight splintering of a bone, occasioning no special uneasiness and leading to no unpleasant results; again the entire diameter of a shaft may be broken and the whole frame be called upon to render assistance during the reparation of the injury; and, in still other instances, the integuments may be torn, a joint laid open, a blood vessel ruptured or an important internal part wounded, by the displaced fragments, when suppuration will ensue, erysipelas may be provoked and an accession of mortification may demand removal of the injured limb. Even plain cases of fracture may become troublesome by the accession of typhoid or the development of struma during confinement; life may be jeopardized when the patient is old, sickly and cachectic; and the constitutional disturbance is always annoying and may become serious by slight inattention, previous or coetaneous bad habits, undue excitement and many other circumstances that are liable to interfere with the progress of recovery. At times, a simple fracture may fail to be united in consequence of bad coaptation or insufficient nutritive capacity on the part of the patient. From all these considerations, therefore, the surgeon ever regards these injuries with an anxious eye; for they are cases which generally call out all his professional knowledge and skill and he is indeed a fortunate practitioner who secures good union without deformity and receives an honorable compensation instead of a lawsuit, as a reward for his care and anxiety.

There are three directions in which a bone may be broken: 1st. *Longitudinally*, in which there is nothing more than a mere splitting of the part in the axis of its shaft. Such fractures seldom show themselves by any deformity of the limb; yet a large piece of a bone may be splintered off (as we have seen from the kick of a horse), or the crack may lie closely to the skin (as along the anterior edge of the tibia), in either of which cases the precise nature and extent of the injury can be detected. 2d. *Transversely*, in which the solution is at right-angles with the axis of the bone. This form is most common to young persons, seldom causes any material injury to the soft parts and generally unites readily. 3d. *Obliquely*, in which the break occurs at an acute angle with the axis. In these cases, the ends of the bone are very liable to be forced out of their position, either by the original violence or the action of the muscles subsequent to the fracture, when the soft parts may be seriously injured by the sharp points of the broken bone.

When the solution of continuity extends no further than the osseous textures, the fracture is said to be a *simple* one; when a breach of the soft parts is made and a wound extends from the skin to the bone, it is a *compound* fracture; when the bone is broken in more than one place, it is a *comminuted* case, and the existence of an external wound with this, renders it a *compound comminuted* one; when a portion of a broken bone is driven into the cancellated structure, it is an *impacted* fracture. These terms, by distinguishing the nature and extent of the injury, define the relative seriousness of different cases; for a simple fracture is a trifle compared to a compound one and compound comminuted fractures call for amputation oftener than almost any other injury to which the frame is liable.

CAUSES.—External violence is the chief cause of all fractures. Direct force produces fewer solutions of continuity than indirect, but the character of the injuries caused by the former is much the more severe of the two. Thus, blows upon the cranium, gunshots and the passage of wagon or rail road wheels, generally cause splintering as well as fracture, and external wounds and lacerations are almost universal complications under such circumstances. Falls, jumps and similar violences, on the other hand, seldom cause any breach in the soft parts, the fracture usually taking place at some distance from the point injured, as when the tibia and fibula are broken by a fall upon the foot and the humerus by a fall upon the hand. Muscular action sometimes breaks the patella and has been known to even split the humerus; but these cases are very rare and occur only in those of enfeebled frames and on occasions where one or two powerful muscles are called into violent action at a time when their antagonizing muscles are at rest.

The more exposed a bone is and the greater the amount of leverage presented by the length of its shaft, the greater is its liability to be fractured. The humerus and femur seem to suffer most frequently; next in order come the tibia and fibula and the radius and ulna; the elasticity of the ribs save them from the rude effects of violence; the metacarpal and metatarsal bones are rarely broken and then nearly always by direct violence; the cranium suffers frequently, while the vertebræ, innominata, tarsus and carpus, are never fractured except by most crushing and direct force.

SYMPTOMS.—Most fractures can be very easily detected, but sometimes, as when they occur close to a deeply seated joint, they may be mistaken for a dislocation or even pronounced non-existent. Some of the symptoms are also similar to those which follow other accidents, thus rendering the cases obscure till a very careful examination has been made. The following circumstances will serve to distinguish all fractures except those of the vertebræ, internal tablet of the skull and longitudinal cracking of the long bones:

1st. The shape of the limb is altered and the part is more or less deformed in consequence of displacement of the ends of the fracture. When this displacement is trifling, as may be the case in all transverse fractures, the deformity may not amount to more than a slight change in the curve of the parts, together with a trifling tumefaction. When the limb has been rotated, when the fracture has been oblique or when the fractured parts have been pushed aside of each other in a transverse fracture, the deformity will be more readily perceived and the broken points can usually be at once detected under the integuments. The limb is also liable to be bent at unusual angles and the parts are generally displaced from their natural positions. These displacements may not occur immediately, but generally follow within an hour or two after the injury, being caused either by direct muscular contraction, by the force of the original violence or by rude handling after the fracture or by the weight of the parts themselves. In cases of broken skull, the displacement seldom amounts to more than a slight depression, which may be detected with difficulty when the lapse of a few hours has allowed tumefaction to take place: the same may be said of fractures of the vertebræ and broken ribs are not liable to any more than a momentary displacement upon pressure from the surgeon's hand.

2d. There is an unnatural mobility in the parts that is never found in any other class of accidents. The patient is not able (in the case of a limb) to move the distal aspect of the fracture, but the surgeon can carry it in various unnatural directions without meeting any obstacles or (except when sharp points project from the fracture) causing the patient any pain. In accidents of this kind upon the short and flat bones, motion is impossible, except when the cranium is so shattered as to admit of being depressed. In impacted fractures, mobility is not present.

3d. Crepitus, or a grating sound produced when the mobile ends of the fracture are rubbed together, is an unequivocal evidence of the exact nature of the injury. In order to hear this sound, the fractured ends must be rubbed directly together, when it can be readily distinguished from the slushy kind of crepitus that may be heard in emphysema and some cases of dislocation. In impacted fractures, however, as well as in slight longitudinal cracks of a bone, it is not present.

In examining a limb supposed to be fractured, the surgeon should strip his patient, that nothing may intervene between him and the part with which he has to deal. The sound limb should be also uncovered, that diagnosis may be facilitated by the opportunity for comparison. If the case is a plain one, no manipulation is necessary, but every measure must be taken to clear up all doubts and diagnose the exact nature, form and extent of the injury, without leaving any thing to "guess work." The manipulations of the surgeon must be conducted with decision, yet with all possible gentleness; and no one symptom should be depended upon alone, but all of them weighed together and the decision based upon their aggregation. It is well to remember that dislocation of a bone sometimes occurs in connection with its fracture.

NATURAL REPARATION OF FRACTURES.—More or less blood is extravasated among the structures immediately after the occurrence of a fracture, but this, at about the end of twelve days, has nearly all disappeared by absorption and a plastic effusion has been thrown out in its place. This effusion is the immediate result of inflammatory action, is poured out by the bone, periosteum and soft parts and is formed into layers upon both the medullary and periosteal surfaces of the fractured structure. By extending beyond the broken extremities, it completely incases them in its folds and serves as an immediate support, keeping the parts from too much motion and maintaining them in better apposition than they would be if left to themselves. This effusion has been technically termed the "provisional callus." The callus is large, soft, thickest opposite the point of fracture, tapers each way and looks like a mass of pink jelly. This plastic deposit gradually thickens till, at the end of about the fourth week after the injury, it becomes a firmly fibrous or fibro-cartilaginous substance. True ossification then commences and the callus is gradually formed into a dense bone—a process which usually occupies from four to six months before it is completed. In the meantime, a still slower process of ossification has been going on between the ends of the bones themselves and is the "definitive callus." This is the last act in the process of reparation, usually requires several months for its perfection and takes the place of the "provisional callus," which, having served the temporary purpose for which it was intended, gradually disappears by absorption.

FIG. 24.

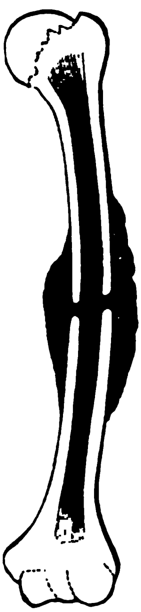


FIG. 25.

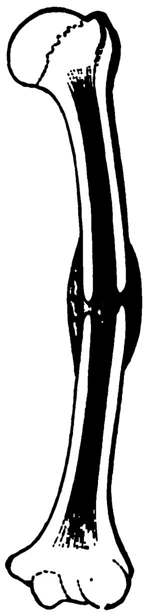


FIG. 24.—Recent fracture of humerus, showing extravasated blood.—MILLER.
FIG. 25.—Provisional callus, in an advanced stage of organization.—MILLER.

The amount of provisional callus (or plasma) that is formed, depends entirely upon the extent of the injury, the steadiness with which the bones are kept in position and the vigor of the patient. In comminuted fractures it is large; in simple fractures, where a steady position is not maintained, it is also large and may continue to be thrown out for some weeks after the injury; while in cases where close coaptation is preserved and the patient is hearty, the fibrinous exudation may scarcely extend beyond the fractured ends of the bones themselves. In a few rare cases (occurring chiefly in old persons and in those patients where the bones have not been held in a firm position), the definitive callus may not form at all, union by dense ligaments being all that nature can then effect. Within the capsule of the femur and in the cranial bones no provisional callus is thrown out—union by the definitive callus taking place directly, though slowly.

PRINCIPLES OF MANAGEMENT.—The first thing to be done, in managing a fracture, is to bring the several parts in apposition—to coaptate or *set* them. This should always be practiced at the earliest possible moment, as the muscles are then most relaxed and irritation and feverish excitement (commonly provoked by motion in the parts) will be prevented. In some instances, this purpose will be accomplished by putting the limb in that position which will afford the greatest relaxation to the muscles, as extending it to relax the triceps when the olecranon is broken. Position alone, however, will not always complete the coaptation, although it is a measure that should never be forgotten either in the act of setting bones or during retention after adjustment has been made. In a great majority of cases, extension upon the distal aspect of the broken bone and counter extension upon its cardiac aspect, are necessary for reduction. Violence should never be used and a very moderate degree of power will suffice in all cases but those of impacted fracture, which are very rare. Should the excited muscles attached to the lower fragment offer opposition, a few good sized doses of lobelia tincture should be used and the part bathed with the same, and then extension may be attempted. Should the muscles still remain tense, the lobelia may be continued till relaxation is secured (which will be in two or six hours, according to the amount of medicine used), and then coaptation may be accomplished without any difficulty—irritation around the parts being also allayed and an over active febrile excitement anticipated by these measures. The surgeon is never justified in forcibly reducing a fracture; and it is far better to wait a few hours and relieve the spasmodic tendency of the muscles by lobelia, than to be over hasty in applying improper extending power. In fractures of the patella, olecranon and some other cases, coaptation is effected by pushing the parts together rather than pulling them apart. Directions as to which class of means is best suited to particular cases, will be given in coming sections of this chapter.

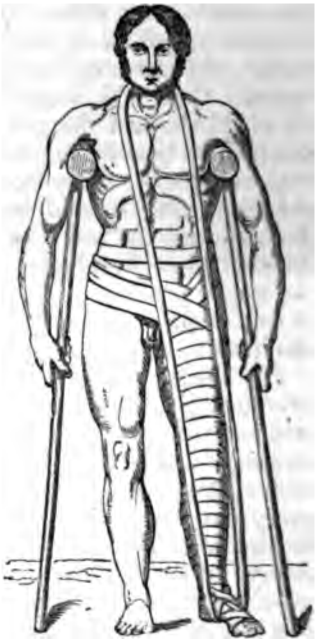
But, while it is easy to set a broken bone, it is a very difficult matter to keep it in its place—to prevent the natural contractions of the muscles from drawing it out of position and to guard it against future displacement by motion or force. The length of time required to repair a fracture, leaves the patient liable to many disturbing accidents and the surgeon has an excellent opportunity for displaying his mechanical skill during the weeks occupied in the reparation of the injury.

The patient should always be placed in the easiest position possible and the bed upon which he lies should be level and firm—a hair mattress with a low pillow being best. If the larger bones of the lower extremity are injured, the bed should be made with a drop opening, that feces may be voided and removed without disturbing the body. These things having been attended to, the part must be placed in a natural position (a matter requiring care and exactness) and then made firm either by splints or bandages—which must be so arranged as to not admit of the least motion that can disturb the forming callus, yet without being fastened in a manner that will impede circulation and favor gangrene. To avoid the last danger, every thing that is applied should be made to bear its pressure very evenly over the largest convenient extent of surface. Thus, if splints are used, they should extend several inches in each direction beyond the fracture and (in some cases) they should be several feet in length; when bandages are employed, they should envelop the larger portion of the limb or pass over the whole trunk. A soft cushion of stuffed straw or bran should be made for the limb to rest upon.

The shape and stiffness of the splints depend upon the size of the bone that has been injured, very thin board (lined with cotton pads) being required for some cases, leather answering for others and pasteboard, gummed felt, gutta percha and stiffly starched muslin, being oftentimes sufficient for every purpose. Two or four splints may be used, according to the locality and form of the fracture, and they should always be as light as possible and retained in their places by evenly wrapped bandages. In applying the bandages, it is best to leave them a little slack at first; for tumefaction will always follow a fracture, and great inconvenience and even serious consequences may be provoked, by making the first dressing too tight. The roller bandage is now in favor among surgeons, but is open to the strong objection that it can not be undone without disturbing the limb very much. A more appropriate one may be yet devised. The part should be bathed with warm soap suds each time it is dressed, which should be done only when the bandage has become loose or uncomfortable.

Starched bandages are highly recommended by many surgeons, and Mr. Erichsen places his whole reliance upon them, even in fractures of the femur. That author thus describes the method of preparing and applying these bandages (System of Surgery, p. 190): "A dry roller is first applied to the limb, the osseous prominences of which are carefully and thickly padded with cotton wadding. If it be the lower extremity that is injured and the fracture is very movable, a many tailed bandage will be found to be most convenient. This must be smeared with stiff starch; over this should be laid splints of thick and coarse pasteboard, properly cut to fit the limb, extending beyond the joints nearest to the fracture and well soaked in thin starch. If much strength is not required, as in children or in some fractures of the upper extremity, a few slips of brown paper, well starched, may be substituted for the pasteboard. A bandage saturated with thick starch must now be firmly applied; and, lastly, this is to be covered by another dry roller, the inner sides of the turns of which may be starched as it is laid on. During the application of this apparatus, extension must be kept up by an assistant so as to keep the fracture in position; and, till the starch has thoroughly dried, * a temporary wooden splint may be applied to the limb. * * If the fracture be compound, a trap may be cut in the apparatus opposite the seat of injury, through which the wound may be dressed." Mr. Erichsen applies this bandage immediately and finds that the evaporation consequent upon the drying of the starch prevents swelling of the limb. It keeps the parts steady and allows the patient to leave his bed many days (and even weeks) earlier than is possible when splints are used. The bandage may be left unchanged till it gets too loose or becomes uneasy, when it may be cut up with a pair of blunt pointed scissors, the limb

FIG. 26.



Starched bandage applied to lower extremity; patient out on the eighth day after fracture of thigh.—ERICHSEN.

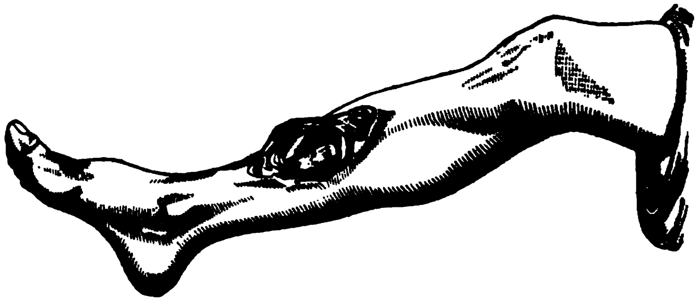
washed and rubbed carefully with the hand and a fresh apparatus applied, as before.

Fracture always provokes more or less contraction in the muscles connected with the broken bone and arterial excitement generally supervenes and lasts for several days. In order to provide against both these consequences, the patient should be directed to take a lobelia pill every six or eight hours and drinks of sage, boneset, asclepias or other relaxant, should be used when the constitutional excitement is considerable. Sometimes the muscular spasms become so strong as to prove troublesome, by drawing the bone out of apposition, when free doses of lobelia tincture must be given to secure proper relaxation.

The position of the limb must be carefully attended to, not only with a view to secure the greatest ease to the patient, but also to favor venous return. If the limb is allowed to hang down, edema will be likely to result, hence a recumbent position or slings must be made to favor the return circulation. It is also necessary for the practitioner to guard his patient against the too early use of the injured part, as unsightly deformity may be caused by taxing the bones before the provisional callus has become firmly consolidated. Even when the starched bandage is used, too much care can not be taken on this point; and when splints are preferred, the utmost cautiousness must be observed and quiet positively enjoined for four, six or eight weeks, according to the extent of the injury and the reparative power of the constitution. And during this period of rest, the surgeon himself must be careful to leave the bandages undisturbed as long as possible; for every time they are changed, motion in the parts is strongly probable and reparation will be somewhat delayed by even the slightest disturbance. Yet, when the bandages become tight or the limb feels numb and cold, all appliances must be at once removed, a few hours rest allowed, friction employed and then the dressings carefully readjusted; for gangrene becomes strongly probable under such circumstances, and it usually advances with so little local uneasiness or constitutional premonition, that the surgeon can not be too watchful of its approach. If mortification seems probable, all bandages must be at once removed, the part left to rest upon a pillow and systemic stimulation pushed vigorously. If the destruction can not be thus averted, amputation must be practiced early. This is a necessity, however, that seldom occurs in any but the worst cases of compound or comminuted fractures and may be generally averted by close attention to the functions and the general health.

Compound Fracture.—This form of injury is much more serious than any of the simple fractures, especially when the breach in the soft parts is caused by the same violence that produced the solution of continuity in the bone. Suppuration occurs along the track of the wound and sloughing may eventually follow. The provisional callus is thrown out less abundantly and organizes less speedily than in other cases; profuse purulent discharge may lead to prostration and hectic; and phlebitis, or other erysipelatous affection, may be provoked in persons of gross habit. Sometimes the part will be so shattered as to demand immediate amputation; or the evils that supervene upon the injury may be so extensive as to demand the removal of the limb.

FIG. 27.



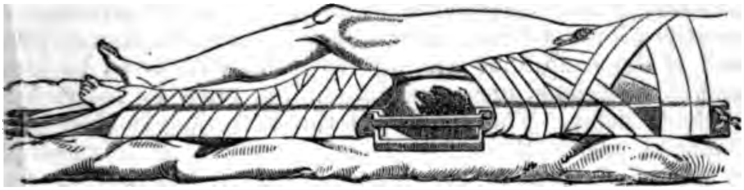
Compound and Comminuted Fracture.

The first question to be determined, in a case of compound fracture, relates to the probability of saving the limb, which must be done whenever it is possible; but the circumstances are sometimes too unfavorable to warrant such an attempt, and then amputation should be performed at the earliest possible moment. The surgeon's own tact and intelligence must decide this question in individual cases, for it is next to impossible to define what ones are, and what are not, curable. The following points will serve as a general guide: The injury is more grave when upon a lower extremity than it is when upon an upper extremity. Old age and a frame enfeebled by disease or bad habits lessen the probabilities of obtaining a large provisional callus and healthy granulations. When the bone is shattered into numerous splinters, the flesh torn away and greatly lacerated and large arteries injured, gangrene is likely to be extensive and the knife is probably all that will save the patient (see, also, p. 306).

If the practitioner concludes to attempt to save the limb, he should proceed to reduce it as if it was a case of simple fracture. Loosened fragments or sharp points of bone may be present in the wound: the first should be removed and the latter cut off by the bone pliers or saw, as their presence would serve to provoke pain and contraction in the part and greatly increase the danger from subsequent gangrene or erysipelas. The soft parts must be next adjusted carefully, as has been already directed in the section upon *Lacerated Wounds.* If the wound is trifling, as may be the case when it is caused by the protrusion of a sharp point of the fractured bone, the close coaptation of the parts and exclusion of air by a layer of collodion, may be all that is required. In some cases, a few sutures may be necessary, although stitches should never be introduced when it is at all possible to get along without them.

In applying splints and bandages to a compound fracture, the wound itself should be always left uncovered, that it may be reached and dressed at any time without disturbing the retentive apparatus. When splints are used, they should be arranged after the manner illustrated in the accompanying figure. When the starched bandage is preferred, a kind of trap door must be made in it at the part over the wound. The sore can then be readily dressed, cleanliness practiced and the progress of the cure watched.

FIG. 28.



Arrangement of the Splint in Compound Fracture of the Femur.

Irrigation with cold water is the best local management for the first few days. The contingency of constitutional irritation should be anticipated by the use of asclepias, mentha or eupatorium infusions and an occasional pill of lobelia. The bowels must be kept properly unloaded, the patient left undisturbed and his diet carefully regulated. If extensive infiltration should take place in the limb and the bandages become tightened, they should be loosened at once. In the course of a few days, the febrile excitement will abate and the wound become a suppurating sore. If granulation advances favorably, cold water dressings or a simple cerate, with due elevation of the limb and proper hygienic regulations, are all that are necessary. If suppuration becomes profuse, the wound must be washed with any gently stimulating and astringing infusion and the general strength must be sustained by tonics

and drinks of such diffusible stimuli as zinziber and
lochia. If the patient is of a scrofulous diathesis, or if th
tem seems clogged with morbific materials, alterant
must be pressed vigorously and the tonics and stimulant
tinued. If the patient is threatened with bed sores fron
confinement, he must be placed upon a hydrostatic bed
the limb may be eased by being fixed in a hammock
ported by uprights. The dressings to the wound mu
changed frequently, all accumulations of pus and blood
be allowed the freest possible exit and every care mu
taken of the patient's health during the weeks or month
such an injury may keep him to his bed.

A compound fracture may advance favorably for a
and then some unforseen accident provoke phlebitis. (
may accumulate under the muscles and be sufficiently ich
to cause sloughing of the soft parts and even necrosis
bone. Gangrene of a large portion of the limb may
denly appear (especially in the summer season), and p
hemorrhage may occur from the capillaries or more
bleeding follow destruction of an artery by the advan
mortification. All these circumstances render the case se
and if the conditions can not be quickly removed by
and constitutional measures, amputation must be resor
without delay. The success of the operation is then
doubtful and nothing but large quantities of aristol
composition, capsicum, third preparation of lobelia or s
stimuli, can keep the patient from sinking after the lim
been removed.

Stiffness of a joint, consequent upon long confin
and disease, may be overcome by gradual motion, fr
local vapor baths and cold water douches. When a fr
has been united with the limb in a deformed condition, i
be necessary to break up the callus and manage it as if
a case of simple fracture. When the callus is too fi
admit of this, Professors Pancoast and Mutter have re
to the operation of removing a wedge shaped piece of
as is practiced in some cases of anchylosis. But this
tion is justifiable only in cases of great deformity.

Non Union of Fractures—False Joints.—When the fra
extremities of a broken bone have not been held in po
with sufficient exactness, but have been subjected to fre
motion, the definitive callus is seldom formed, the provi
callus is loose and the part remains ununited. When
patient is old, cachectic, scorbutic or tainted with syph
provisional callus may not be thrown out at all; or, if
formed, it may be too soft and small to retain the pa

position, when union of the broken fragments is again rendered impossible. Or, in still other cases, a fair amount of plastic material may be thrown out, but remain unossified, when it will be either formed into a cartilaginous looking material and molded into a rude resemblance to a joint or organized into ligaments and connect the broken ends of the bone. These are true cases of *false joints*. Both these sequences of fracture are rare.

TREATMENT.—When, after the lapse of several weeks from the fracture, the surgeon examines his patient's limb and finds it still ununited, his first procedure must be to readjust it carefully and either splint or bandage it with all the skill of which he is capable. Then the system must be invigorated with tonics, stimulating alterants, nourishing diet and every hygienical regulation that can add to the systemic vigor. A few weeks more may (under such constitutional management) secure the effusion of firmer plastic material, the formation of a definitive callus and the ultimate reparation of the injury. It is not proper to be too hasty in saying that the system can not remedy the abrasion; for nature will perform astonishing feats when properly assisted by hygiene and good medication, and many an unpromising case of ununited fracture has been effectually, though slowly, repaired without the interference of instruments and operations.

When, however, several months have elapsed and the bone still remains freely movable, the part becomes free from sensitiveness and the fractured points can be felt smooth and rounded, all hope of direct plastic reparation may be at once set aside and operative procedure commenced. The first thing to be attempted is to excite a gentle inflammatory action in the parts. This can be generally done by rubbing the extremities of the fracture together frequently, by supporting the limb with splints and then having the patient exert some force upon it, and by applying fomentations of polygonum over the part. In the meantime the system must be invigorated by emetics, vapor baths, stimulating alterants and other means calculated to secure healthy action and favor the production of abundant tissue plasma. These measures will sometimes secure the desired result in a day or two, at other times it may require some weeks to get up a fair degree of inflammatory action. When a gentle degree of local arterial excitement has been secured, the parts must be adjusted by a starched bandage, or splints, and treated as if the case were an ordinary fracture.

When these attempts fail and the limb still remains ununited and useless, the last resource left to the surgeon is to cut down upon the broken part, shave off the ends of the fragments and then readjust the parts with splints and bandages. This is a severe operation and should never be undertaken except in extreme cases, and then only after the system has been well prepared by a course of tonic and alterative medication. The operation is in all respects analogous to that of Resection of Bones, under which head it will be more fully discussed.

Fractures of the Cranium.

The cranium may be fractured in the form of a simple fissure, the tablet of the skull remaining undepressed and no spiculæ of bone being loosened. When any of the upper bones of the head are thus injured, no material evil is likely to follow, unless the violence has been sufficient to cause concussion, or an intercranial artery or sinus has been ruptured by the violence. The scalp may remain unabraded and the fissure be so slight as to be traced with difficulty. In rare instances, however, the basilar bones of the skull may be broken and the petrous portion of the temporal bone may be split, when blood may ooze continually from the ears and nose or cause death by extravasation within the cranium. Such cases very seldom recover.

In cases of severe violence upon the head, the bones may be broken into several fissures, which generally radiate irregularly from a center. The fissures may be simple, or spiculæ may be split off from their margins and either remain loosely in their original positions or be displaced at various angles. When such spiculæ are upon the outer tablet of bone, they seldom occasion any greater inconvenience than excitation of the periosteum and scalp; but when they are upon the inner table of the skull, their displacement may lead to congestion and suppuration—grave results when occurring in this position. Cranial fractures of this extent are almost invariably accompanied by depression of the bones, and wounds of the scalp (rendering the cases compound ones) are not uncommon. Erysipelas is a very common sequence of all degrees of this injury; the excitation of the brain strongly disposes the patient to inflammatory action and delirium; blood may be extravasated between the bones and the dura mater and suppuration is a possible result of the violence. These unpleasant consequences may follow the simplest forms of such fractures, or they may even follow blows and falls upon the head when fracture does not take place. They constitute the chief danger of these cases, but their special consideration will be reserved for Part IV of this volume.

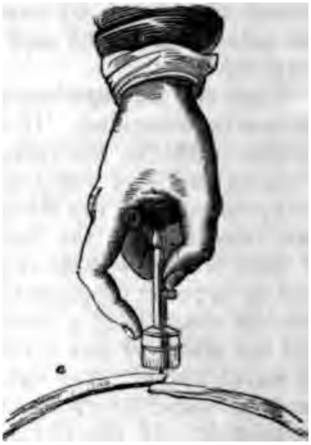
MANAGEMENT.—The first care must be directed to the state of the circulation and the blood is to be prevented from rushing too ardently to the brain. Bathe the hands and feet in warm water into which a little capsicum has been put; give small doses of lobelia infusion every ten or twenty minutes, unload the bowels by enemas of lobelia and elm and place the patient in a cool and airy room, moderately lighted and perfectly quiet.

When the fracture is a simple one, no direct surgical interference is demanded. If a wound of the scalp exists in connection with the fracture, the integuments must be carefully replaced and cold water applications kept upon the part. If erysipelas sets in, the whole head should be shaved and the case treated after the manner of erysipelas in general. But if there is considerable depression of the skull and consciousness is blunted (apparently by the osseous pressure), the hair must be shaved off, a crucial incision made through the scalp and the plates of the cranium carefully lifted into their place by an elevator. Any spiculæ of bone that may be present must be carefully removed by the pliers and the scalp then readjusted. If the depression is in such a form that the elevator can not be used, the straight edged trephine may be employed to cut a small slice off of one edge of the fissure, through which the former instrument may be then inserted. In using the elevator, care must be taken to *lift* up the bone and not use the instrument as a lever and the edge of the fissure as a fulcrum.

When consciousness does not return after the use of the elevator, or if the fracture is a comminuted one and the depression can not be remedied by this instrument, or if there is ground to fear the existence of pressure by extravasation (see Affections and Injuries of the Head, Part IV), the circular trephine must be resorted to. But the surgeon should not be hasty in employing this instrument, which is only called for in well defined cases and on occasions when it is rational to expect that some good may be done by it. The use of the trephine has generally been quite too common for the welfare of the patient. When, however, circumstances render the operation necessary, choice should be made of the smallest sized instrument that will answer the demands of the case. The surgeon should always have several sizes of these at his command and no operator should consider his tion of instruments complete unless it embraces a good . This instrument is used in the following manner:

The scalp and periosteum having been divided and turned back, the center pin is rested upon a firm portion of the skull. If the bone is depressed on one side of the fissure, the pin should be placed upon the portion that is most solid, which is the one that rides over the other. If the fracture is a comminuted one, two very small openings may be made by the circular trephine in the sound bone and the circumferences of these united by two straight incisions; or the difficulty may be reached and remedied by a simple straight incision along one edge of the fissure; or a large circular saw may be used and a resting point made for the center pin by laying a bridge of bone or ivory over the depression, letting the teeth of the instrument play beyond the bridge. Having attended to these preliminaries, the saw is then turned backward and forward in a semi-circle. The teeth of the instrument cut during the movement from right to left, at which sweep of the hand light pressure should be made. The motions of the instrument must be steady and the pressure light. When the center pin has been fixed long enough to allow the teeth of the saw to make a groove, it should be raised up and the operation continued with great caution. When the bone has been cut through, it is to be lifted out carefully and delicately, all broken fragments and clots of blood are to be removed and the scalp properly replaced.

FIG. 29.



Trephining for Fracture of the Cranium.

Fractures of the Bones of the Face.

Fracture of the Ossa Nasi.—When the nasal bones are fractured, little can be done till the swelling has somewhat subsided, an end which may be furthered by the use of cold water compresses. Then the bones are to be lifted into their places by a spatula or the blades of a pair of polypus forceps. If they remain in position, nothing further is necessary than to keep the patient quiet for a few days and apply cold water freely. Hemorrhage may be checked by bathing the hands and feet in hot water or applying pressure around the upper lip. If the septum has been broken, a plug of soft wood, covered with silk, may be required to keep the organ in form for a few days.

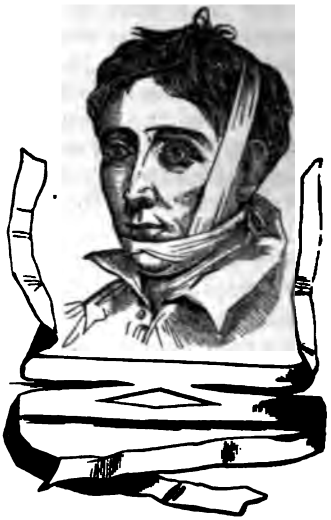
Fracture of the Malar and Superior Maxillary Bones.—When the malar bone is broken, it can be retained in position by Barton's bandage (which will be presently described). When the superior maxilla is fractured, all teeth and portions of the alveolar process should be preserved as far as possible. These parts are to be replaced and held in position by silk ligatures, or pieces of fine gold wire, wrapped around the sound teeth in that manner which will be best adapted to the necessities of individual cases. Spiculæ of bone imbedded in the flesh or muscles must be removed and the jaws must be used as little as possible—the patient being fed upon thin food. Deformity commonly follows severe fractures of the malar bone.

Fracture of the Inferior Maxillary.—The lower jaw is most frequently fractured through its body, near the symphysis, but may be broken at its angle, through its neck or even at its processes. The violence that causes it may be direct, but is most frequently indirect, through the symphysis. The mucous membrane is very commonly abraded, allowing hemorrhage into the mouth. Sometimes this fracture may be both compound and comminuted, as from the kick of a horse. It may be known by irregularity of the line of teeth, inability of motion by the patient while undue motion may be made by the surgeon, and by the ordinary crepitus. Saliva usually flows abundantly and the fragments are likely to be much displaced when the fracture is near the symphysis and beyond the insertion of the muscles at the ramus. Fracture of the ramus or condyles generally causes much pain in the ear and is often difficult of detection.

MANAGEMENT.—All loosened teeth and cracked pieces of alveolus must be replaced, as they will be likely to be retained by osseous union; the severed ends of the jaw must be then coaptated and, if necessary, the sound teeth stayed by ligatures of silk or gold wire. Then a piece of gutta percha, or pasteboard, may be softened in hot water and molded snugly under and around the chin and a bandage applied over the whole. Dr. Barton, of Philadelphia, has introduced a very simple bandage, which is now generally employed by American surgeons. The roller should be about two inches wide and the compresses under the chin may be made of gutta percha, pasteboard, batting or other suitable material. Dr. Sargeant (Druitt's Surgery, p. 235) thus describes the mode of its application: "Place the initial extremity of the roller upon the occiput, just below its protuberance, and conduct the cylinder obliquely over the center of the left parietal bone to the top of the head; thence descend across the right temple and the zygomatic arch and pass beneath the chin to the left side of the face; mount over the left zygoma and temple to the summit of the cranium and regain the starting point at the occiput by traversing obliquely the right parietal bone; next wind around the base of the jaw, on the left side, to the chin and thence return to the occiput along the right side of the maxilla; repeat the same course, step by step, till the roller is spent and then confine its terminal end." The bandage should be secured by pins at its several crossings. It is a neat and superior appliance.

The bandage of Dr. Gibson consists of a simple roller, which is applied by passing it under the jaw and over the top of the head several times; it is then turned at right-angles and passed over the temples and around the occiput and forehead; similar turns are then made around the front of the chin, along the side of the jaw and under the ear to the occiput. The several turns should be fastened firmly where they cross each other and the whole may be steadied by passing a strip from the root of the nose over the top of the head to the occiput. But the old fashioned four-tailed bandage is the most easily applied device that has ever been used. It is employed as follows: Two ends of the bandage are tied over the head and the other two behind the occiput. The bandage should be made to fit snugly and a piece of grooved cork may be placed between the teeth on each side of the jaws. The cork has the advantage of keeping the teeth in line, but may be omitted or removed if it excites an annoying flow of saliva.

FIG. 30.



The Four-tailed Bandage and its Application.

Fracture of the inferior maxillary unites readily, in consequence of the great vascularity of this portion of the skeleton. From four to six weeks generally suffice to make reparation firm; and, during the first two or three weeks, the patient should be fed upon soups and other light victuals and directed not to talk. The bandage should be kept on till union is complete.

Fractures of the Shoulder and Thorax.

Fracture of the Scapula.—The peculiar shape of the scapula, its position and the variety of motion given to it by the number of its muscular connections, render most fractures of this bone quite difficult to manage. But the same mobility and hidden position that interfere with the art of the surgeon on the one hand, serve to lessen the liability to fracture on the other; hence the scapula seldom suffers this injury. Yet the bone is liable to be broken at four distinct points, as follows:

1st. The *body* of the bone may be fractured by direct violence or (as has been reported in one case) by muscular action. The line of the fracture is generally on a parallel with the spine of the scapula and an inch below it; but the breach observes no rule in its position and may occur at any point and in any direction. The motions of the joint are but slightly impeded, crepitus can be felt only when the hand is laid flatly upon the bone and the humerus then moved. There is always much swelling and soreness externally and the ribs and thoracic viscera are liable to be injured by the transmitted force of the violence that broke the bone. By supporting the arm in a sling and passing a few layers of a broad bandage around the chest and over the scapula and the arm, coaptation may be readily preserved. Of course, motion of the arm must be forbidden and due time allowed for union to take place. If pleurisy or other disturbance of the chest should follow, a free use of asclepias, lobelia pills and enemas, will be sufficient to quiet the excitement.

2d. The *neck* of the scapula is sometimes broken, in which case the glenoid cavity and coracoid process are separated from the rest of the bone, the glenoid cavity being also usually split into fragments. The weight of the limb (aided by the pectoralis and subscapularis muscles) drags the pieces of fracture downward into the axilla, in which position it bears a strong resemblance to the downward dislocation of the humerus. The fracture may be diagnosed by the usual crepitus as well as by the facility with which the surgeon can raise the bone to its place, from which it will immediately drop when he lets go his hold upon the limb. A dislocation of the humerus can not be thus easily reduced and will not leave its place so quickly and will rarely drop from it at all after it has been returned to its socket. The acromion is depressed and

the arm lengthened in this fracture. Treatment is
in the axilla and the retentive apparatus ordinarily
fracture of the clavicle.

3d. The *acromion* is broken oftener than any other
the scapula, its prominent position rendering it more
suffer violence. When fractured, the arm falls down
and can not be raised beyond a moderate angle, the t
shoulder is flattened, the clavicle is drawn down u
coracoid process, crepitus may be heard when the hu
lifted up and rotated and the point of fracture may be
by running the finger along the spine of the scap
managing it, the arm should be supported in a sli
bound closely to the side by a few folds of bandage, th
being held outwardly by a pad. The head of the
should not be lifted out by any pad in the axilla,
would but carry the broken fragments apart. Union i
always ligamentous.

4th. The *coracoid* process is occasionally fractured,
accident is *very* rare and can be caused only by direct
It may be detected by the inability to raise the arm
and forward, the motions performed by the coraco b
and biceps muscles being rendered impossible by thei
a firm point of attachment. The fractured pieces
brought together by carrying the arm over the chest
the fingers may rest upon the shoulder of the opposi
This position relaxes the pectoralis minor, biceps and
brachialis and, by retaining the arm thus, reparation
dered most probable.

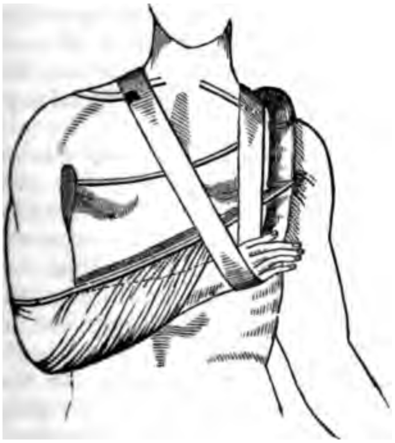
Fracture of the Clavicle.—The clavicle is generally
indirectly, the violence being applied either on the ac
the body of the scapula or the hand. It is occasional
tured by direct violence. The middle of the bone
point most frequently severed and the one that is mo
cult of retention and liable to be united in a deforme
tion; but fracture sometimes occurs within the point c
tion of the acromio-clavicular and coraco-clavicular lig
and the acromial tip of the bone is also occasionally
off.

When the clavicle is fractured at its middle, it
easily detected by the following signs: The arm drop
ward and inward and the head of the humerus falls
forward, in consequence of the loss of that natur
which holds it outward and the action of the mu
drawing the scapula forward. The acromion is flatter
thrown down toward the sternum, and the sternal end
clavicle rides up prominently—appearing to be thro

ward although retaining its natural position. The patient can not move his arm except a very little backward, he supports his elbow with the well hand and sits with his head thrown downward on the affected side, the depression of the clavicle can be distinctly traced by the finger (the acromial end of the fragment bearing strongly inward and lying nearly at a right-angle with the sternal fragment) and crepitus can be readily produced when the shoulder is lifted upward and carried outward and backward. But when the fracture has taken place under, or outwardly from, the claviculo-scapular ligaments, its detection is more difficult, the ligaments and the broad surface of the bone serving to keep the parts in place till some sudden muscular attempt displaces them and shows the diminished power of the shoulder joint.

MANAGEMENT.—The indications in this fracture are perfectly plain: The arm must be supported and the head of the humerous held outward and backward by firm pads in the axilla and bandages of an appropriate character. But, while the nature of the management required is so plain, the position, shape and connections of the broken bone, render it very difficult to sustain the parts in close apposition. Nothing but scrupulous nicety in adjusting the bandages, sling and pads, can secure good union and the surgeon need not feel chagrined if slight deformity follows treatment in a majority of cases. The appliances devised by Dr. Fox, of Philadelphia, are now favorites with the profession in this country and are probably the simplest and most appropriate means that have ever been introduced. This apparatus consists of: 1st. A wedge shaped pad nearly the length of the humerus, four inches wide and two and a half inches thick at the base. It should be stuffed firmly with bran or chopped straw and a piece of tape is to be fastened at each end of the base. 2d. A cylindrical collar, also stuffed with bran or straw. 3d. A sling for the forearm, made loose and somewhat in the form of half a coat sleeve. The fractured ends of the bone having been adjusted by lifting the humerus upward and outward, the base of the

FIG. 31.



Bandage for Fracture of the Clavicle.

pad is to be placed in the axilla and tied around the neck by passing the tapes over the opposite shoulder. The stuffed cylinder is then passed up the sound arm and adjusted like a collar upon the shoulder of that side. The forearm is then placed in the sling, from the cuff of which a tape is passed up and tied at any desirable point on the front of the collar and two other tapes (one at the elbow and the other half way up the humerus) are passed across the back and tied at proper points on the hinder part of the collar. By making the pad of the size best suited for particular cases and adjusting the position of the forearm so as to bring the bones in firm apposition, a great majority of these fractures can be snugly healed by this apparatus. The figure shows the apparatus with a band passing around the neck and supporting the hands—an addition to the appliances that is serviceable in maintaining light pressure upon the sternal end of the fracture. Many modifications of Fox's apparatus have been devised, but the principles to be answered are in all cases the same; and as this means has done better service than any other that has ever been devised, the surgeon can place confidence in it, making such alterations or improvements on it as his ingenuity or the necessities of different cases may suggest.

Fracture of the Ribs.—The elasticity of the ribs saves them from the rude effects of violence and they are never broken except by the application of very severe force. Their fracture is generally caused directly, yet sudden compression upon the front and back of the thorax may lead to solution of continuity at some intermediate point of the bones. The middle ribs are most frequently fractured and the breach seldom occurs at any other than their middle third.

The osseous and muscular connections of these bones render displacement in any direction next to impossible. The surgeon has his attention called to the nature of the difficulty by the severe pain at the point of injury and by the increase of suffering caused by motion, coughing, deep inspiration, &c. The case can be diagnosed only by great care in tracing the course of the bones with the finger and a close application of the ear to detect crepitus. Sometimes a splinter of bone may penetrate the pleuræ and excite inflammation; or the lungs may be reached in the same manner, when air may escape through the pleural wound into the cellular tissue of the trunk and lead to general emphysema.

This fracture is readily managed by fixing the thorax with tight compresses, so that respiration may be wholly performed by the diaphragm. Plain roller bandages, from four to seven inches wide, may be used for this purpose; or the plain soap plaster may be employed; or broad strips of the common diachylon plaster may be fastened firmly around the body. Whatever means is used, it should be applied when the air is well respired from the patient's lungs; and the ends designed by the wrappers should be furthered by perfect quiet, a recumbent position, light diet and regular unloading of the bowels. When the ribs upon opposite sides are broken, no bandages are applicable, but union must be favored by perfect quiet and relaxation. If febrile excitement is provoked, it may be soothed by drinks of asclepias and a little lobelia. If a troublesome cough arises, a sirup of aralia, symphytum and inflata, should be used to relieve it.

Fracture of the Sternum.—The breast bone occasionally suffers fracture, which is manageable by the same course as that which was directed for broken ribs.

Fractures of the Upper Extremities.

Fracture of the Humerus.—The *shaft* of this bone is frequently broken, its exposed position rendering it liable to numerous accidents. The fracture may occur above the insertion of the deltoid or at any point between the insertion of that muscle and the condyles. When it is situated below that muscle, the upper fragment will be displaced outward and upward and the lower fragment drawn inward and upward. When the fracture is above the deltoid, this muscle (aided by the biceps and triceps) will carry the lower fragment outward, while the pectorales will displace the upper fragment inward. All control over the motion of the limb is lost, the arm is plainly deformed and the seat and character of the injury can be readily detected. The management of these cases is very simple. Two splints are to be adjusted to the arm—one upon the outside, reaching from the acromion to the condyle and there forming a right-angle and extending to the points of the fingers, the other upon the inside, fitting into the axilla and reaching a little beyond the inner condyle. The hand should be fastened in a semi-pronated position, the thumb lying in a line with the anterior surface of the humerus. Anterio-posterior displacement of the broken fragments may be prevented by using two splints of pasteboard, placing one upon the front and the other upon the back of the bone; but the two first mentioned splints will prove sufficient when the fracture is below the insertion of the deltoid. Padding should be used to snugly fill the hollow between the arm and the splints and a bandage wrapped over the whole. The *hand* should be supported in a sling passed around the nec the *elbow* should be allowed to hang downward, as th serve to retain proper extension upon the lower fragn the humerus, whereas displacement of that fragment would be very likely to result from passing a sling un whole of the forearm. A long pad may be placed b the humerus and the chest and the arm gently conf the body by a couple of layers of a broad bandage.

The *anatomical neck* of the humerus may be brol great violence upon the acromion or the head of th itself. The joint retains its normal form, but is ext painful; crepitus is heard upon rotating the body of merus and motion is lost. Sometimes this fracture tal impacted form, the head of the bone being driven ir cancellated structure below. The limb is then a little ened, the joint is stiff for a time, but crepitus and imm are not noticed. When the fracture is so complete capsular that no shreds of ligament remain connecte the upper fragment, necrosis of the head may ensue mand removal by an operation. When some shreds of tissue remain connected with it, necrosis may not take and the impacted form of fracture is here very favor it provides against necrosis and the unpleasant train c dents that follows in its wake. Treatment consists si the maintenance of quiet and applications of tincture of during the continuance of the local excitement.

Fracture *through the tubercles* or at the *surgical neck* bone are much more common than the above variety head of the bone remains in its cavity, while the upp of the lower fragment is drawn inward against the co process and the elbow thrown slightly outward. Dep below the tubercles is plainly felt; crepitus is readily pr by drawing the arm down a little and rotating it, wh motion of the upper fragment can be felt under the co process—motions of the head of the bone not followi motions given to the shaft. Several methods are ado managing this fracture. Some surgeons place a wedge pad in the axilla, apply two humeral splints upon the and inside of the shaft of the bone and bandage the to the side. Mr. Erichsen doubles a broad piece o leather and puts it between the arm and the chest t the upper end of the lower fragment outward. Pr the most efficient apparatus (and that which most com fulfills the indications) is a rectangular splint applied inside of the arm from the axilla to the fingers. A pad (base upward) should be fixed on the inside of this plain pasteboard splints fastened along the shaft of the humerus from the acromion and then bandaged, the hand alone being supported by a sling and the elbow confined to the side.

Fracture of the humerus *near the condyles* is generally oblique, sloping from behind downward and forward. The lower fragment is then drawn upward and backward. If the fracture runs from behind upward and forward, the lower fragment is displaced in the same direction. The external appearances of the parts strongly resemble dislocations of the radius and ulna; but the fracture may be diagnosed by the ease with which it can be reduced, by crepitus and by the absence of that fixed position of the forearm which accompanies dislocations at the elbow. In treating these cases, the forearm must be flexed and the hand partially pronated, in order to relax the biceps, triceps and brachialis muscles and give the patient the greatest ease. An angular splint, like the letter L, is to be then fastened in front of the humerus and forearm, extending from the middle of the humerus to the hand, or even to the fingers. The splint should be grooved to accommodate the pronated position of the radius. Many surgeons use rectangular splints, putting one on the outside and one on the inside of the arm, making them of pasteboard and padding them well; but irritating pressure upon the condyles is likely to be produced and the simple rectangular splint will answer every purpose and is not open to this objection. The hand should be snugly supported in a sling and the surgeon should make gentle motion at the joint at the end of the fourth or fifth week after the injury, as stiffness of the elbow is very apt to follow this accident.

Either of the *condyles* may be fractured, when displacement is but trifling and the nature of the injury is not easily detected except by motion for crepitus. The management is to be in all respects the same as for fracture above the condyles, though the rectangular splints may be more serviceable and less objectionable than in the other cases. If the fracture is a comminuted one, the shaft being broken and the condyles split apart in the middle, both the angular splint and the two rectangular splints at the sides must be employed. The hand should, in all these cases, be supported and passive motion commenced at about the fourth or fifth week—stiffness of the joint being strongly probable.

Fracture of the Ulna.—The *shaft* of this bone is the part most frequently broken and most fractures occur a little below its center. The lower fragment is displaced toward the radius by the action of the interosseous and pronator radii muscles.

It is readily managed by passing two splints along the forearm, each reaching from the elbow to the ends of the fingers and being adjusted along the anterior and posterior aspects of the bone. The radius should be semi-pronated and a long triangular pad should be placed between the radius and ulna, in front of the arm, to prevent the lateral displacement.

The *olecranon* occasionally suffers fracture from direct violence and has even been known to be severed by the action of the triceps muscle. If the ligaments are torn through, the olecranon will be drawn upward about an inch and a depression will be felt at its original site. The forearm can be readily bent by the patient and then the displacement of the fractured process is rendered very distinct. Extension can not be made except by the surgeon. Occasionally the ligamentous connections will remain nearly entire, when deformity will be slight and voluntary extension possible to a limited degree. In treating it, the forearm should be kept steadily extended by a splint passing over the anterior aspect of the joint. The triceps muscle is thus relaxed and a figure-of-eight bandage around the joint will serve to keep the olecranon near its natural place. Osseous adhesion is not possible and ligamentous connection is all that the surgeon should look for; indeed, this mode of union is preferable, as a large callus might cause anchylosis or otherwise interfere with the motions of the joint.

The olecranon frequently suffers compound fracture—an accident which, from its proximity to a ginglymoid joint, is much more troublesome than a compound rupture in the shaft of a bone. As usual, the wound must be cleansed of all spiculæ and the soft parts thoroughly irrigated and snugly adjusted to their proper positions. The arm should be held steadily extended by a splint passing on its anterior aspect from the middle of the humerus to the fingers; but the bandaging should be so arranged as to leave the elbow open to manipulation, that washes and suitable medicaments may be applied to it. Cold water irrigation is the best wash, but tincture of lobelia, diluted compound tincture of myrrh and other relaxing and stimulating agents, may be employed when indicated. Should anchylosis take place or suppuration and necrosis threaten the limb, the head of the ulna may be resected. Amputation is sometimes advised under such circumstances, but resection should be first tried and the limb sacrificed only when no other resource is left to the surgeon. Fortunately, thorough and judicious application of proper medicaments seldom allows the case to assume that degree of seriousness which demands any operation whatever. To avoid the contingency of anchylosis, however, the surgeon should practice gentle motion of the joint at the fourth or fifth week. If the surgeon finds it impossible to prevent obliteration of the joint, he should sustain the forearm nearly at right-angles, this being the most useful position.

The *coronoid process* is occasionally broken, but the accident is very rare and nearly always results from muscular action. The triceps muscle, meeting no resistance, draws the ulna backward and prevents the motions of the elbow, while the biceps draws up the coronoid portion of the bone. The biceps must be relaxed by flexing the forearm, when a good sling may be made to retain the parts in this position till reparation takes place. Ligamentous union is to be expected.

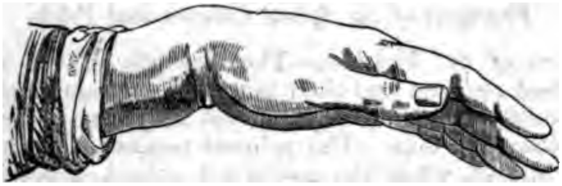
Fracture of the Radius and Ulna.—Both bones of the forearm are frequently broken, or one may be completely fractured while the other is simply bent and splintered. As these fractures always result from violence (either direct or indirect), the solutions of continuity may take place at any point between the elbow and wrist, though they more frequently occur at the middle and seldom exist near the upper ends of the bones. The fracture may be in one direct line through the two bones or it may take place in a variety of positions and directions. The ordinary mobility and crepitus of fractures will readily point out the nature of the difficulty, while the interosseous muscles will draw the broken ends of the two bones together and produce decided deformity along the sides of the forearm. The lower fragments are sometimes displaced by being drawn upward behind the upper fragments; pronation and supination of the hand are impossible, and the patient generally holds the forearm in a half-bent position. When the fracture occurs near the wrist joint, diagnosis from dislocation is made by paying attention to the position of the styloid processes as compared with that of the deformity and by the greater extent of passive mobility in cases of fracture. Management consists in placing a long triangular pad between the bones to keep them outward from each other and then applying a long splint upon both the palmar and dorsal aspects of the forearm. The hand should be fastened in a semi-pronated position and the splints made broad enough to keep the bandages from pressing against the outer edges of the radius and ulna, as such pressure would cause displacement inward and might lead to permanently deformed union in that position.

Compound fracture of the forearm is very common, but it is an injury that is nearly always amenable to good management and very seldom calls for amputation. Even compound and comminuted fractures of these bones rarely demand the use of the knife. A large provisional callus, however, is usually thrown out in these cases, the two bones may become united and motion of the radius prevented by a firm interosseous bridge. The surgeon should keep the hand half proned, as that would be the most usable position in the event of such an osseous union.

Fracture of the Radius.—The radius is more frequently broken than the ulna and very commonly suffers fracture from indirect violence, as falls upon the palm of the hand. It is broken at the *middle* oftener than at any other point and the nature of the injury can be then very easily detected upon running the finger along the outer edge of the arm. When the fracture occurs in the *upper third* of the bone, the superior fragment will be displaced by supination and the inferior fragment drawn toward the ulna and partially pronated. If the bone is broken *below* the insertion of the pronator muscles, both fragments will be made to approach the ulna and be at the same time pronated. When the fracture is situated *near the carpus*, the upper fragment is drawn inward and toward the ulna and leaves a distinct depression on the dorsal aspect and a corresponding prominence on the palmar. The styloid process of the ulna projects sharply against the skin; the hand no longer lies in a direct axis with the forearm; the radius is motionless, though a false pronation and supination may be performed at the shoulder joint; and forcible supination causes keen pain. Crepitus may not always be readily detected and impacted fractures at this point can not be diagnosed till extension has separated the fragments, when the nature of the difficulty can be distinguished by the ordinary signs. When the bone is broken near its *neck*, firm pressure must be made upon the upper fragment while the hand is being rotated. If the upper end of the bone does not follow the motions of the lower end, solution of continuity is certain.

All fractures of this bone are managed much in the same way. A long splint is to be placed upon the palmar and another upon the dorsal aspect of the forearm, reaching from the condyles to the ends of the fingers. The splints should be broad and well padded and a triangular pad should be used to separate the bones whenever the radius is displaced toward the ulna. When the fracture is above the insertion of the pronator muscles, the upper fragment being drawn backward, the hand should be fastened in nearly a supine position; in all other cases the semi-pronated position is to be selected. The forearm should always be flexed and the whole may be supported in a sling after the bandages have been adjusted. Fractures near the carpus are frequently followed by stiffness at the wrist and inability to use the fingers freely. To provide against these results, a broad splint (cut somewhat to the shape of the forearm) may be padded and fixed to the palmar surface, extending from the humerus to the digital ends of the metacarpal bones. A firm roll of broad bandage material may be laid upon the lower end of this splint, where it will serve as a support to the palm of the hand; and, by grasping it with the fingers, the patient will prevent stiffness of the joints.

FIG. 32.



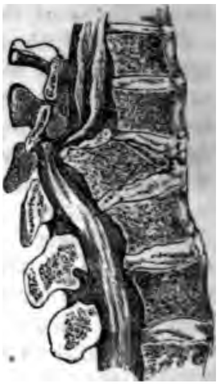
Fracture of the Lower Extremity of Radius.

Fracture of the Hand.—The *carpus* is fractured only by the most direct and severe violence and the injury is nearly always compound—the flesh wounds being usually extensive and much lacerated. The *metacarpal* bones are more easily broken and the solution is not often compound; the same may be said of the phalanges. In treating these injuries, the splints must be arranged to accommodate the natural curve of the bones. If the phalanges or outer metacarpals are broken, pasteboard splints with a curved pad are necessary. If the carpus or middle of the metacarpus are injured, the hand may be made to grasp a large bunch of firmly matted tow. Amputation is very seldom called for, even in severe compound and comminuted fractures of these parts, and it is surprising to witness the extent of injury from which the bones of the hand will successfully recover. Removal of spiculæ and dirt, free irrigation with cold water during the first few days, application of diluted "hot drops" when the lacerations are severe and congestion threatens, and the free use of lobelia internally and externally if erysipelas appears, will generally succeed in saving most unpromising cases. If the use of the knife should become positively necessary, the surgeon should remove just as little of the member as possible. If even one joint of a finger can be saved, it should be by all means done; for the hand is such an important member, and is called into such hourly use, that its loss always proves a serious inconvenience. If the thumb and a couple of fingers can be saved, time may render them so subservient to the will that they may be made to perform the ordinary duties of the hand with remarkable ease.

Fractures of the Spinal Column and Pelvis.

Fracture of the Vertebræ.—The strength of the vertebral bones, their position and their muscular surroundings, render their fracture extremely difficult, yet they may be broken by heavy blows and falls. The spinous processes are most frequently injured, when the case is not serious except from the concussion of the spinal cord that may be produced by the same violence that caused solution of continuity in the bony structure. When the bodies of the vertebræ are broken, however, the case generally assumes a serious aspect from the first, and death is very likely to supervene within a few weeks, even if it does not take place immediately. The cord may be fatally compressed by extravasation of blood, concussion may produce a shock from which the patient never recovers, spiculæ of bone may wound the nervous center and lead to slow suppuration or displacement of the broken fragments may compress the column to such an extent as to render death inevitable. "According to the seat of injury, the nature of the case materially varies. When the *lumbar* region has suffered, the more prominent symptoms are paralysis of the lower limbs, usually with loss of sensation [the patient may be pinched, pricked or even burned, without realizing it], involuntary discharge of feces, retention of urine and, frequently, priapism. When the injury has occurred in the *upper dorsal* or *lower cervical* region, in addition to these symptoms there are paralysis of one or both arms, difficulty of breathing, sluggishness of the bowels, with distention of the abdomen. If, again, the fracture be *above* the origin of the *phrenic nerve*, and compression there prove great, respiration will cease at once, causing death" (Miller's Surgery, p. 335). The urine is usually very turbid in all these cases.

FIG. 33.



Fracture of Spine.

Fractures of the vertebræ are generally detected very readily by an inequality in the line of the spinous processes, pain at the seat of injury and inability to support the body erect.

In some cases, however, the signs may be very equivocal. The patient may be able to move about, but will carry himself stiffly; the paralysis of the lower parts may be too partial to attract much attention and nothing may be specially observed except pain and irritation in the column, which may be fairly attributed to concussion without the existence of fracture being more than dimly suspected. Some slight and unguarded motion, however, may displace the fragments of the broken bone, when compression of the cord, paralysis and even immediate death, may follow.

In treating fracture of the spinal column little can be done beyond keeping the patient as quiet as possible, giving him a hard bed to lie upon, attending to the urine and feces and guarding against bed sores—a very common result of the confinement and loss of active circulation in these cases. Reduction is impossible and life can scarcely be prolonged more than a few weeks or months at most. The urine should be regularly drawn off with a catheter, the diet must be generous, enemata of lobelia and ginger should be used to unload the bowels and a hydrostatic bed should be provided when possible. Some operators have sought to give relief by cutting down upon the spinal column, removing the spinous processes and then trephining through the wings of the bone. It was thought that the cause of the compression might be thus removed and life saved; but experience has not justified the anticipations that were raised and the operation is now generally abandoned by prudent surgeons.

Fracture of the Os Innominatum.—The innominata are never fractured except by the most crushing violence, as the passage of heavy wheels. The crest of the ilium may be broken, the fracture may occur in and through the acetabulum or the rami of the pubes may suffer rupture. The bone is likely to be splintered and the fragments to be displaced. Laceration of the integuments is very common; and contusion and injury to the pelvic viscera are almost certain to result from the original violence, and these constitute the chief danger. The urethra may be torn, the bladder ruptured or the vagina and uterus pierced, by spiculæ of the broken bone. Urethral and vaginal discharges of grumous blood may then follow; congestion and suppuration may supervene, to the imminent risk of life; and soreness, heat, renal irregularities, tympanitic state of the abdomen, fever and paralysis, make a common chain of symptoms. Sometimes the injury is so great as to prove immediately fatal by violence to the nervous system; or the viscera may be so bruised and torn as to be soon destroyed by gangrene, when death is almost certai

Or the danger may not be at once felt; but, displaced fragments remaining in unnatural positions, abscesses may be formed and prostration and ultimate death caused by the keenness of the agony and the waste of chemical destruction.

The broken fragments can usually be felt by the surgeon; but when the fracture occurs through the more distant portions of the bone, detection of the real nature and extent of the injury is more difficult. Great pain and soreness among the pelvic viscera is the only sign that may be present; and, as too much manipulation in examining a patient may cause further displacement of fragments and spiculæ and thus result in further injury to the viscera, it is better to leave the diagnosis in a little obscurity than to push the investigations too far. As these bones heal very readily when broken and as the cases are to be mainly treated for the injuries done to the organs within, this prudence in withholding manual explorations is not liable to prove detrimental to the patient; while, as has been just hinted, too much manipulation may result seriously.

In treating these fractures, the surgeon should maintain the pelvis in a quiet position by having the patient lie upon a hard bed, which should be provided with a trap for the voidance and removal of fæces. Relaxation of the system should be secured by a constant use of lobelia, ulmus water should be given freely, galium or seeds of arctium are advisable when the urine is turbid or scalding, tonics should be given when the strength and appetite fail and all typhoid manifestations should be promptly met by the use of diffusible stimuli. Reduction of the broken fragments is seldom possible; indeed, their displacement is generally so trifling that reduction is not rendered necessary and osseous union commonly takes place in due time and leaves no deformity.

Fracture of the Sacrum.—The position, thickness and sponginess of the sacrum, render it still less liable to fracture than are the innominata. Nothing but extremely severe and direct violence can cause its solution. The accident becomes a grave one on account of the injury usually done to the sacral nerves and the lacerations of both the internal and external soft parts. It is to be managed by keeping the patient quiet, relieving febrile excitement with lobelia and attending to functional derangements in the ordinary ways. The *coccyx* is occasionally broken, when much suffering, inflammatory excitement and swelling, commonly result, and the pain is aggravated by motion of the thighs. Rest and relaxing applications are the only measures that can be of service; and the soreness around the parts generally continues for several years.

Fractures of the Lower Extremities.

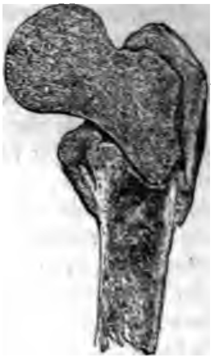
Fracture of the Femur.—Solution of continuity may occur: 1st. *Within the capsule*, or through the neck, of the femur—an accident peculiar to old age. It very seldom occurs in persons under fifty, and those more advanced in life are still more liable to it. The increase of cancellated structure and fat globules in the bones of the aged, together with the change to a more horizontal position that occurs in the neck of the bone after the middle period of life, will readily account for the ease with which the femur is sometimes broken at this point. The accident may follow from very trifling violence, as stubbing the foot, twisting the limb suddenly or missing a step in going down stairs. Blows and falls upon the hip may become direct causes of the rupture, and sometimes the bone is severed so easily that it appears to occur almost spontaneously.

Attention is called to the injury by the pain in the joint and the inability to stand. When the patient stands uprightly, the toes are everted and the limb is seen to be shortened from half an inch to two inches. The broken fragments of bone are separated, the head remaining fixed in the acetabulum by the ligamentum teres, while the shaft is drawn upward and slightly outward. If the capsular ligament is completely ruptured, this displacement is considerable and the shortening and eversion of the limb are proportionally great; but when the capsule remains entire, or is but partially ruptured, displacement is slight and shortening and eversion may not be noticed till one or two days after the accident. The knee is flexed a little, the patient can not raise the limb except with his hands, the hip is slightly deformed by depression of the trochanters and crepitus may be heard on extending the limb and then rotating it. In some instances, the head of the bone is impacted in the parts below it, when the shortening will scarcely exceed half an inch; motion of the limb may be partially retained, crepitus and eversion are seldom noticed, but a stiffness and half helplessness of the joint denote the nature of the difficulty.

Osseous union of the parts by a good definitive callus is scarcely possible in these cases and the fragments either remain ununited or a kind of fibro-osseous junction takes place, the neck of the bone being shortened by absorption and trifling deformity and uselessness of the part following. True osseous reparation of these parts may be interfered with either by the feeble nutritive powers of old age, the want of a sufficient quantity of tissue plasma in the upper fragment, or the difficulty of retaining the parts in good coaptation. When, however, the capsular ligament has not been ruptured and displacement of the fragments is trifling, when the fragments are partially or wholly impacted and when the patient is vigorous and rather young, good reparation may take place. But in a majority of instances, the surgeon can not expect to accomplish much by way of restoring the usefulness of the limb, and very old and very feeble patients need not be troubled by being confined to a hard bed and tightened with splints, as no advantage can be reasonably expected and bed sores and loss of vigor may be induced. The limb may be arranged on pillows and the patient should be made as comfortable as possible.

2d. Fracture *external to the capsule* is a more manageable accident than the former class of cases and is not so likely to occur in the aged and debilitated. It is always caused by direct violence and is more frequently impacted than the fracture through the neck of the bone. The limb is always shortened, the lower fragment being generally lifted an inch and a half or two inches above its natural position. The foot is everted, crepitus is very distinct and the parts swell very much and suffer intense pain. When the upper fragment is impacted, the shortening may not be greater than half an inch, eversion is trifling, crepitus is seldom distinct and the use of the limb may be retained to a considerable degree. Diagnosis is then difficult, and nothing but much care in examining the patient and weighing the character of all the signs present can enable the surgeon to form a sound opinion on the nature of the injury. The same may be said of all the fractures at this point, which are sometimes strongly similated by rheumatic affections, simple contusions and dislocations. The history of a case must be always inquired into and the decision based upon that history and the aggregation of the signs that are present.

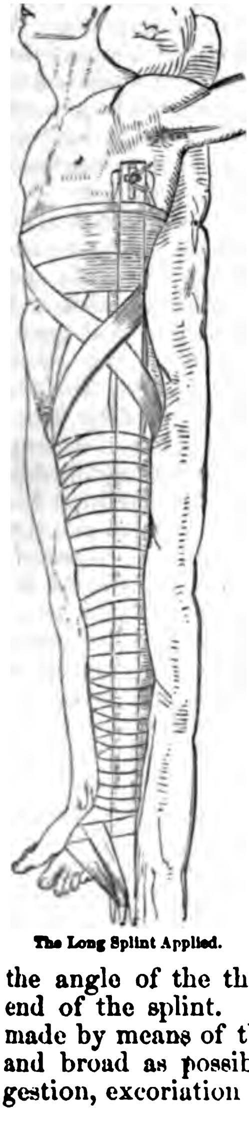
FIG. 34.



Impacted Fracture of the Femur through the Trochanters.

In treating this fracture, extension of the lower fragment is to be made upon the foot and the upper fragment is to be held in position by a perineal bandage attached to the head of a long splint. The splint may be made of a plain piece of board, three-eighths of an inch thick, six or seven inches broad at one end and tapering to the width of four inches at the other. The upper end should be cut out in the form of a crutch and a hole bored through it, and the lower end sawed into two or three large teeth, the whole being long enough to reach from the axilla to five or six inches beyond the sole of the foot. The handy surgeon can at any time make a suitable splint of this kind out of a smooth piece of board of the proper thickness, and this is what most practitioners in the country have to do. Many finished splints for this purpose are in the market, among the simplest of which is that of Dr. Physick, which only differs from the above in having a block dovetailed at right-angles into the lower end of the long board, that the extending force may be applied to it more directly in a line with the axis of the limb. Dr. Gibson applies a long splint to each limb, in order to keep the pelvis from rotating, and there is an upright shoe-piece, movable by a rachet, at the end of each. Extension can be thus increased at pleasure, but counter extension has to be made in the axilla—a tender point and one that is unreliable on account of the facility with which the scapula moves about. The principles and plan are the same in them all and the surgeon may make his selection according to his taste or necessities. We have found the rough hewn splint, manufactured for the occasion, to be as good as any. In applying the long splint, it should be first padded and then placed upon the outside of the broken limb, the broad end of it in the axilla. A bandage should be made of a silk handkerchief, or other soft material, stuffed with cotton and passed around the angle of the thigh, to be tied in the hole at the upper end of the splint. As the counter extending force has to be made by means of this perineal bandage, it should be as soft and broad as possible and adjusted carefully, otherwise congestion, excoriation and suppuration may be provoked. As

FIG. 35.



The Long Splint Applied.

other handkerchief, or a gaiter shaped bandage, may be passed around the heel and over the instep for the purpose of making extension upon the lower fragment. The limb having been then extended till the broken surfaces are brought into apposition, the instep bandage is to be snugly adjusted to the inner prong of the lower end of the splint. Both the perineal and the instep bandages are to be secured tightly, that there may be no slipping or displacement of the fragments. A three inch roller bandage is to be then wrapped around the limb, beginning at the foot and extending to the perineum. A few turns of a six inch roller may be then made around the trunk, by which means the upper end of the splint will be confined steadily to the side. The patient is to be confined in a perfectly recumbent position upon a hard mattress.

The application of the long splint requires a great deal of nicety; for, as the patient has to keep his bed eight or ten weeks, a bungling and careless adjustment of the pads and bandages will scarcely serve to maintain good coaptation and at the same time guard against excoriation and bed sores. The pads that are attached to the inner side of the splint must be made large and firm, and pressure against the trochanter, condyles and malleolus, must be prevented by making the stuffing full between the intermediate points. A snug swathing of cotton may be passed around the heel and instep before the extending bandage is applied at that point, a depression in the bed may be made to receive the nates and the heel should be guarded against sloughing. In the course of management, the gaiter and perineal bandages should be undone frequently and the parts bathed with diluted compound tincture of myrrh and rubbed gently. The point upon which these bandages press should be varied as often as possible; but the bandage along the limb should never be loosened except when necessary and its pressure should be firmly and evenly maintained. Two much attention can not be bestowed upon these items, and injuries of the skin should be anticipated by the practice of cautious measures, even from the first day.*

The swelling and inflammation around the hip may be treated with cold water. General arterial excitement is to be soothed by infusions of mentha, salvia or other relaxant, and a pill of lobelia may be used occasionally. The bowels must be unloaded with careful regularity and enemas or physic used for the purpose. The diet must be light during the existence of the arterial excitement. As the pulse becomes more natural, the diet may be generous and mild tonics may be needed. This fracture is tedious in its union and some stiffness of the joint and edema of the limb may remain after the patient gets about, but are generally removed by friction, stimulating liniments and gentle use.

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* Dr. Z. Hussey, a Physio-Medical practitioner at Chilicothe. Ohio, has invented the most perfect splint we have ever seen. It places extension and counter extension under the complete control of the surgeon. fixes the pelvis firmly, allows the patient to sit up or recline at any angle and is adapted to limbs of any length and to the management of simple or compound fractures at any point of either the upper or lower extremities. We regret that this instrument has been so recently introduced that we have not had time to procure cuts of it for this volume; for we regard it as a very superior apparatus and one that can be made more serviceable than any similar appliance with which we are acquainted.

3d. The *shaft* of the femur is very frequently broken, both in children and adults, and the solution may occur at any point between the great trochanter and the condyles. In young persons, the fracture is commonly transverse and but little displaced; in elderly persons it is generally oblique, the upper fragment being displaced outward by the pyriformis and external rotator muscles, the psoas and iliacus at the same time drawing it forward. The uselessness of the limb, the eversion of the foot and the readiness with which the point of injury can be felt, render diagnosis plain.

The long splint, described for fracture of the surgical neck of this bone, is also used for fracture of the shaft, being applied and managed in the same manner in both cases. Probably this is the most efficient apparatus that can be used, for it maintains proper extension and counter extension and keeps the lower limb and pelvis well fixed. As there is an inward displacement of the lower fragment and a forward displacement of the upper one, the long splint may be assisted by three strips of pasteboard placed along the front, inside and back of the thigh. Some surgeons employ a double inclined plane, the upper piece extending accurately from the tuberosity of the ischium to the angle of the knee, the lower piece being jointed to the upper one and reaching several inches beyond the foot. A foot board is morticed at right-angles into the end of the lower piece, and a double screw increases or diminishes the angle of the joint at pleasure. Short pasteboard splints should be placed along the front and both sides of the thigh. This apparatus is most useful when the fracture is at the middle or lower third of the bone. When the bone is broken within a couple of inches of the trochanter major, the thigh should be well flexed upon the abdomen and the leg bent snugly upon the thigh—positions which relax the displacing muscles. The patient is to be then placed upon the side, broken limb downward, and an angular wooden splint attached to the outside of the limb, reaching from the hip to the ankle and being well padded to prevent excoriation. A stiff leather splint may be also fixed along the inside of aponeurosis that surrounds the patella. In treating this fracture, the thigh should be well flexed upon the abdomen and the trunk thrown forward (in order to relax the extensor muscles), the fragments gently pushed together and a figure-of-eight bandage applied about the knee. Instead of this bandage, strips of adhesive plaster may be fixed firmly across the fragments in the form of a figure-of-eight, or a mass of gutta percha may be moistened in boiling water, carefully molded over the parts and then fastened in position by a suitable bandage. It generally requires six or seven weeks for ligamentous union to take place and, even then, a too early use of the limb may strain the ligaments and displace the fragments to such an extent as to disable the limb.

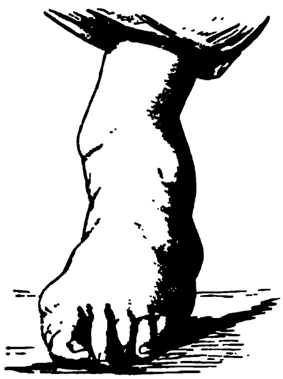
Fracture of the Tibia.—The tibia may be broken at any point from its head to the astragulus, but is most frequently fractured in its middle and lower thirds. Its exposed position and the directness with which it receives shocks transmitted through the foot, cause it to be frequently broken; and compound and comminuted fractures of this bone are among the more common accidents brought before the surgeon. Generally, the nature of the injury is easily diagnosed; yet the fibula serves as such a good splint to the leg, that the fragments of the broken tibia are seldom displaced much, mobility is retained to a moderate extent and there is but little deformity. The practitioner should be particularly careful in his examination when the solution of continuity extends into the knee joint, as errors in diagnosis may be then easily made.

In treating fractures of this bone, the plan pursued must depend upon the nature and position of individual cases. When the fracture is situated near the knee, the limb is to be placed in a straight position and the body sustained forward so as to relax the extensor muscles of the thigh; no bandages are required and passive motion should be practiced after the fourth week. When the solution is lower down and the displacement is trifling, ordinary straight splints may be used; or an extension splint with a foot board may be employed, the upper end of the splint being fixed above the knee by a suitable bandage. But if the fragments override each other very much, they can not always be kept in place by the straight splint, nor by any appliance that confines the limb with its posterior surface downward. It generally proves the better plan, in such cases, to flex the thigh upon the abdomen and bring the heel back almost to the nates; the patient may be then laid upon the affected side and an angular splint fastened from the middle of the thigh beyond the foot. It has been recommended to sever the tendo Achilli under such circumstances, but the procedure seems quite unwarrantable and can scarcely do any considerable amount of good. The starched bandage may be employed in all simple fractures of the middle and lower thirds of the tibia, when there is no displacement of the fragments nor any need of an extending force. The fracture box is a very handy apparatus in compound and comminuted fractures when there is simply lateral displacement. The box is merely a flat piece of board about seven inches wide, with an upright foot board at one end, the other end reaching to the angle under the knee. Two other pieces of board are hinged along the sides of the bottom piece. In using this apparatus, the limb is first laid upon a pillow, or a pile of bran, placed upon the bottom board; the foot is bandaged to the upright foot piece and then the side boards are raised up and fastened at right-angles to the bottom board. If a pillow is used, a sufficient degree of lateral pressure is generally given by simply raising up the side pieces; but bran is a better substance and may be added to the pile in the trough at any time and can be crowded a little tighter at one point than another so as to increase the lateral pressure wherever it is needed. When the lower end of the bone is broken; the double inclined plane may be used, as has been directed in some cases of fracture of the femur; and a sling, supported upon uprights, is often very serviceable and gives the patient an easy position. From five to seven weeks are required to repair this bone, and the surgeon should always "keep the great toe in a line with the inner edge of the patella," as that is the most natural position of the foot and the one in which osseous union will be followed by the slightest possible deformity.

Fracture of the Fibula.—The fibula is generally broken within three inches of the malleolus, and the injury is most frequently associated with more or less dislocation of the astragulus from the tibia. Sudden eversion of the foot forces the external malleolus outward and, if the everting force is considerable, the fibula gives way. The foot is turned outward, lameness is at once felt, the patient leans on the inner side of the foot when he attempts to walk and a distinct depression can be felt along the lower end of the fibula. In treating this injury, the foot is to be strongly inverted and a straight splint applied along the inside of the limb from the condyle of the femur to a few inches beyond the foot. The splint should be well padded, especially at the malleolus and condyle, and the bandage should be snugly applied in such a manner as to keep the foot turned well inward.

Fracture of the Tibia and Fibula.—Both bones of the leg are broken quite as frequently as either one alone. The fracture may be transverse through both bones; or the tibia may be broken near or into the ankle joint, while the fibula is injured a little higher up. It is seldom that the bones are fractured above their lowest third, but the passage of carriage wheels, or the crushing force of falling bodies, may produce solution of continuity at any point. The treatment is generally by the fracture box and bran stuffing, especially if the fracture is a compound one; for this appliance usually keeps the fragments in good coaptation, allows free irrigation or medication of the parts and absorbs purulent discharge readily. If the foot is much twisted out of position, a straight splint may be applied upon the side opposite to that to which the foot is turned. Stiffness of the ankle is sure to follow injuries of this kind into the joint, and it usually takes many months of care to recover the proper use of the part. Friction, local vapor baths and stimulating liniments, as for sprains, constitute the appropriate treatment for the stiffness.

FIG. 37.



Fracture of the Tibia and Fibula at their lower third.

Compound fractures of the leg are of frequent occurrence and rupture of the soft parts at the ankle is a common, as well as a dangerous, accident. The treatment is to be by irrigation, washes of third preparation of lobelia or diluted hot drops, and tonics and alterants to invigorate the system, as has been advised for compound fractures in general (pages 350–351). Amputation is frequently called for when the joint is much injured, but the surgeon can save a majority of these cases by perseverance and good attention, and the knife should not be used till an energetic attempt has been made to save the limb.

Fracture of the Foot.—The bones of the foot can be broken only by direct violence of a crushing character, hence fractures of this part are frequently compound and generally accompanied by much bruising and ecchymosis of the soft parts. The astragulus and calcaneum are most frequently injured, and the fracture of the former bone is always a grave accident. When the os calcis is broken, it may be treated by putting the foot into a slipper, flexing the leg toward the thigh and fastening the heel of the slipper in this position by a cord and bandage around the lower third of the femur. All other fractures of the foot are managed by molds of pasteboard and gutta percha and a relaxed position of the muscles of the leg. Compound fractures of the astragulus must be treated in the manner suitable for other compound fractures, and accumulations of pus at any point of the foot must be let out at the earliest moment, otherwise the member may be destroyed. Although compound solutions are more dangerous here than in the hand, yet the surgeon must not be too hasty in sacrificing the limb.

CHAPTER VII.

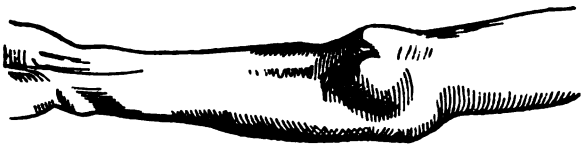
DISLOCATIONS.

Dislocations in General.

WHEN the articulating surfaces of the bones entering into the formation of a joint are forcibly separated, the bone that is furthest from the trunk is said to be dislocated or luxated. The dislocation is known as *complete* when the bones are so far displaced from each other that no portion of their articulating surfaces remain in contact; but is called a *partial* luxation when the bones are thrown but little out of place. The first variety of these accidents is the more common and generally takes place in the orbicular joints, which, from the latitude of their motions, are most likely to be thus injured. Ginglymoid joints suffer less frequently from dislocations, and those that occur are usually but partial. Bones which are united by suture, or those which admit of no motion between them (as the sacrum and innominata), are fractured rather than dislocated. The ligaments of a joint are always put upon the stretch when the bones are displaced, and complete luxations generally cause considerable laceration—always bruising and sometimes tearing the soft parts. The accident may be rendered *compound* either by simple rupture of the soft parts or by rupture and fracture being both coexistent with the dislocation.

SYMPTOMS.—The symptoms or signs of dislocations are, in general, very distinct and the surgeon can usually acquaint himself with the nature of the injury and the exact position of the parts without submitting his patient to tedious and painful examinations. The bones are thrown out of position in such a manner that the relation of their axes is decidedly changed; they are fixed unnaturally and can not be moved by either patient or surgeon (except to a *very* limited extent) and all handling of the parts causes intense pain. The joint is deformed, a distinct prominence being visible at one point and an equally marked depression being found at another, and each of them at positions where neither one is natural.

FIG. 38.



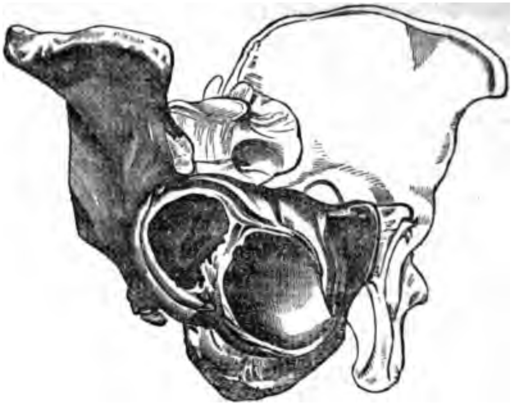
Deformity in Dislocation of the Ulna.

The parts become much swollen after a few hours; no grating crepitus is distinguished and there is, sometimes, numbness of the parts beyond the joint at which the luxation has occurred. The limb may be shortened, as in the dislocation of the ulna and femur upward; or elongated, as when the humerus or femur is displaced downward. The position of the whole limb is, also, usually changed and can not (as in fractures) be restored by the hand of the surgeon at pleasure. But, while these signs are clear and well defined, many blunders have been made in mistaking luxations for fractures and simple bruises, and *vice versa*—errors in diagnosis that are seriously inconvenient to the patient and anything but reputable to the surgeon. Decision, therefore, should be always practiced in making examinations and not only should the true nature of the injury be made clear, but the exact position into which the bones have been thrown should be determined. If several hours have passed before the surgeon sees the case, and he finds the parts greatly swollen and very sensitive, so that diagnosis is impossible, it will be best to give the patient an infusion of asclepias, or mentha, and lobelia, and follow with a general vapor bath. This will relax the system and the excited muscles of the part, and not only render diagnosis practicable, but soothe the patient and favor a speedy reduction of the bones if the case proves to be one of dislocation. This course is particularly applicable in cases where the hip is concerned, as diagnosis is more difficult at that point than at any other.

CAUSES.—Violence, either direct or indirect, is the cause of by far the greater number of all dislocations. Direct force, as was seen in the previous chapter, is most likely to produce fracture, while indirect force (the long bones becoming levers) most frequently forces the head of the bone so strongly against its ligaments as to produce dislocation. Muscular action alone may luxate the head of a bone, but this can only happen when the ligaments are in a very feeble condition; and these cases are of the simplest character, being seldom accompanied by any laceration of the soft structures. Many circumstances, however, favor the easy dislocation of a bone and may be said to stand in the relation of *predisposing* causes. Chronic disease of a joint (whether caries as in the hip, or hydrarthrosis as in the knee) always inclines it to luxation, either removing the articulating support or destroying the ligamentous and cartilaginous connections. Paralytic affections loosen the ligaments and tendons so that they perform their offices very inadequately; and a bone that has been once displaced is always liable to redisplacement upon trifling accidents.

Dislocation is always accompanied by a partial shock (p. 285) and a corresponding degree of muscular relaxation. This is the favorable moment for reduction; and the surgeon who is so fortunate as to be called to a case of dislocation during the period of this relaxation, will find it a very simple matter to restore the head of the bone to its natural position. In a short time (varying from ten minutes to a few hours) the muscles become rigid, seek to accomodate themselves to their new positions, contract firmly and draw the bone further from its articulating fellow. When the muscles have been but slightly injured, they contract but moderately and offer only a slight resistance to the manipulations necessary in reduction; but if they have been ruptured and bruised and if the surgeon has been rough in his examinations, the contrac-

FIG. 39.



Old Dislocation of Hip; new Acetabulum formed.—COOPER.

tions will be proportionally powerful and offer the most decided resistance to the attempts at replacement. The longer the bone remains out of its natural position, the more difficult will it be to return it to its place; for the muscles accommodate themselves to the direction of their new points of attachment and are as ready to hold the bone there as they formerly were to hold it where it belonged, any ligaments or tendons that have been ruptured take new hold and fasten themselves firmly, and there is an effusion of plastic matter thrown out which gradually fills up the old joint and molds the rudiments of a new one.

Principles of Management.—The reduction of dislocations is a very simple operation, when properly understood; but a misapprehension of the manipulations to be made and the mode of making them, may lead the surgeon into trying difficulties. The chief movement consists in bringing the displaced bone in a line with the axis of its articulation, when its muscular connections will at once draw it into place and nothing will remain for the surgeon to do but enjoin rest to the limb. But the success of this movement depends very much upon whether the surgeon co-operates with nature, or misunderstands her and attempts to accomplish his objects in opposition to her. If he allows the former rule to guide him, success will be easy and unvarying; if he pursues the latter course, he will have much trouble and many failures and heart burnings.

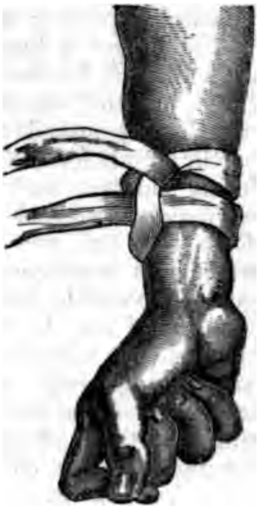
All surgeons have observed that, when a dislocation has recently occurred and the muscles have not yet been contracted by the stimulus of reaction against the partial shock, reduction of even the largest bones can be effected by the most simple manipulations. A little movement of the patient's hand or foot, and lo! the humerus, tibia or femur slips into its place. The muscles offer no opposition to the surgeon when he carries the limb in different directions; and as soon as the axis of the dislocated bone is brought into or near the axis of the articulation from which it was separated, it slips into place without further difficulty.

Instead of profiting by these facts and seeking to imitate the relaxation of nature, it has been (and still is) the common practice to attempt the reduction of dislocations by forcibly overcoming the contraction of the muscles which hold the bone in its new position. Extension and counter-extension, either by the hands of assistants, with the clove hitch or by ropes and pullies, were the measures taken for this purpose. The practice has been commonly successful, but the success has always been at the expense of much toil on the part of the surgeon and intense suffering on that of the patient. The operation was one of main force, the contrivances of mechanism warring against the contractile power of muscles: and when we take into consideration the astonishing capacity of contractile tissues, it can not be wondered that bruisings, lacerations and serious injuries to the joints have followed the violence which has too commonly been used in these operations. The whole mode of procedure is the very opposite of the plan of nature and, while extension and counter-extension are often necessary, the whole parapharnalia of ropes, pullies and levers, should be discarded at once. The following plan will be found equal to the reduction of any dislocation, and that without the necessity of many assistants and with no suffering to the patient:

Give the patient an infusion of asclepias, or mentha, and lobelia. Make the infusion weak and give it warm and in considerable draughts every few minutes. If the patient vomits, so much the better; but the infusion should be used till the perspiration becomes free and the stomach feels decidedly nauseated. Attempts at reduction should be then made by the mode to be presently described; but no force or violence should be used and, if the limb is not easily movable, the relaxing drinks should be pushed regularly and the patient placed in a vapor bath of a low temperature. These means will soon loosen the tissues and relax every muscular fiber in the frame. This is the opportune moment for action; and a few proper manipulations will now carry the limb to its place without much labor or pain. This relaxing course may not be needed at all in some cases, as in the tibia; or a few draughts of the infusion and the application of lobelia tincture to the joint will answer in others; while in dislocations of the femur of several hours standing, it may take several other hours to loosen the structures to a proper degree. Of this the surgeon must be his own judge, according to the nature of the case before him; but the potency of these means can be relied upon with the most implicit confidence, and no Physio-Medical practitioner should allow himself to be persuaded to attempt the reduction of any considerable bone (that has been long luxated) till he has thoroughly and completely relaxed the patient in the manner above directed.

When the patient has been thus prepared for the operation, reduction is to be made by the process of manipulation. This consists in simply freeing the head of the bone from any hollow into which it may have lodged, and then carrying it toward the articulating surface from which it has been displaced. The dislocated bone itself is the only lever required purpose; and the fulcrum may be the operator's hand, ixation of the axilla downward, a jack towel, as in ment of the femur into the obturator foramen, the rroundings, as when the head of the femur is lifted .e dorsum ilii by the acetabulum, or any other point y be best suited to the nature of the case. Generally, ds of the surgeon are sufficient the movements, though a clove d an assistant may be sometimes geous. The bone is to be car- ly in such directions as the form ticulation demands, and we have et seen or heard of a case in it did not succeed almost im- ly, and that (in many instances) e utmost justifiable force by had been resorted to in vain. n has been employed for more lf a century, having been in- l by the family of Sweets, of ticut. The remarkable ease with those gentlemen would reduce t stubborn luxations, and those Allopathic surgeons of note had ver in despair, led many of the people to attribute their suc- he possession of some supernatural power. Physio- surgeons have always employed it (except when . to do otherwise by the fascination of more fashion- des), the preparation of the patients by lobelia and or bath being of their introduction. The plan is cientific and is not a mere whim of a day; for, though llopathic writers are now making attempts to intro- is mode of procedure as being original with them- t is notorious that one of the Sweet family published volume upon the subject many years ago and the has been a common one since the beginning of the century.

Fig. 40.



Clove Hitch.

s are so easily put into place by the above means, that ersons can scarcely believe it possible that the diffi- s been remedied by such a trifling expenditure of nd this impression has sometimes led surgeons to con- eir manipulations after reduction has been effected, rrying the soft parts if not actually redisplacing the The bones may be known to be in position by the readiness with which they obey the surgeon's hand

and by the patient's own ability to perform the natural motions of the part—a little stiffness of the muscles alone being complained of. The bones always remain in place after having been returned and no deformity nor unnatural position is observable. By keeping the patient at rest, bathing the joint with tincture or infusion of lobelia and administering infusion of mentha, or asclepias and zinziber, all unpleasant sequences of the violence will be averted.

The longer a luxated bone remains unreduced, the more difficult will be its replacement; and dislocations of two or three months' standing are not often meddled with. The muscles accommodate themselves to their new positions, semi-cartilaginous formations partially or wholly fill up the articulating surfaces and a very serviceable degree of motion is ultimately acquired by the dislocated portion of the limb. Reduction can not be effected except by much force: new tendonous attachments may have to be undone, there is danger of lacerating nerves and rupturing blood vessels and the bone itself may be fractured in these attempts. Even when the bone has been dislodged from its false position, the natural articulating surface may be found so firmly filled with organized plasma that the surfaces can not be retained in coaptation. If these efforts at reduction should fail, the patient is commonly worse off than he was before; yet perfect replacement may be sometimes effected and increased latitude of motion may be secured in some cases where the attempt has not been crowned with success. The surgeon must judge of the propriety of meddling with the cases brought before him, the general rule being that dislocations of ginglymoid joints can not be reduced after the fourth week and the orbicular joints after the third month.

Compound Dislocation.—When a bone is luxated with much violence, the tissues may be ruptured so as to form an external wound, when the case becomes a compound one. Such cases are not immediately dangerous, but extensive suppuration is very likely to ensue and may demand amputation. Reduction having been effected, the case is to be treated by medicaments (according to its condition) as if it were a compound fracture; and the same considerations determine the propriety or impropriety of amputation in both instances.

Sprains.—It frequently happens that external violence may be so applied to a limb as to stretch or "sprain" the ligaments of a joint, without being sufficient to cause actual dislocation. The part swells, is extremely painful, becomes stiff and is so tender that motion can not be performed. If the synovial membrane has been much bruised, the symptoms of an acute synovitis may be present. The pain and swelling may subside in a few days; or the injury may have been so great as to cause permanent tenderness and stiffness of the joint, when lameness will result and the limb may become atrophied from disuse.

TREATMENT.—The joint may be swathed with flannels saturated with lobelia infusion, or a poultice of ulmus and lobelia seeds may be laid on, and local vapor baths employed in addition thereto. If the case assumes a chronic character, a local vapor bath, medicated with such stimulants as absinthium and abies, may be used two or three times a day; a liniment of lobelia, capsicum and origanum, may be applied after the baths; downward friction with the hand may be directed frequently and the electro-magnetic battery may be used several times each day. In long standing cases, it may require nine months or a year to re-establish a good circulation in the limb and restore a fair degree of pliancy in the ligaments; and two or three years of persevering management may be necessary to perfect a cure.

Dislocations about the Head and Trunk.

Dislocation of the Inferior Maxillary.—The lower jaw may be displaced either by violence upon the chin or by the action of the depressor muscles when the mouth is opened very widely. One or both condyles slip forward into the zygomatic fossæ, while the coronoid processes become entangled with the edges of the malar bones. The chin is thrown downward and forward, the mouth can not be shut, speech is interrupted and saliva drools over the unclosed lips. When only one condyle is displaced, the same signs exist in a less marked degree, the chin being also thrown to the side opposite to the dislocation and a distinct hollow may be felt before the meatus on the injured side. Reduction may be effected by placing the thumbs upon the lower molars and pressing downward, at the same time raising the chin with the fingers. Two pieces of cork may be placed as fulcrums between the back teeth, the chin being then lifted upward and pushed gently backward by the hand. The four-tailed bandage should be applied for a few days and the patient directed not to talk or eat any solid food for a week or more, as displacement may be easily reproduced.

Dislocation of the Vertebræ.—The position, connection, limited motion and broad articulations of the vertebral bones, render their displacement a remarkable rarity. The following luxations, however, have been met with: 1st. The *atlas* has been known to slip from the condyles of the occiput in consequence either of caries, scrofulous disintegration or exostosis at the joint. Many months of pain and tenderness may precede luxation, which usually takes place suddenly and almost spontaneously, causing immediate death. 2d. The *vertebra dentata* may be separated from its articulation with the atlas by carrying the head strongly to one side. Violent motion of this kind may tear the ligamentous connections between the foramen magnum and the processus dentatus, and it is not then difficult to carry the body of the vertebra forward of the articulating process of its fellow, *on one side.* In a few rare instances the dislocation has been reduced and the patient's life saved, by very gently lifting the head up and bringing its long axis in a proper position. When, however, the displacement has been the result of articular disease, or when the transverse ligament has been broken by sudden violence and the dental process luxated backward, death is immediate and inevitable.

Dislocation of the Clavicle.—Violence upon the shoulder may luxate the *scapular extremity* of the clavicle, throwing it upward and allowing the acromion to slip forward and downward. The acromion is depressed and the clavicle is seen riding upon the spine of the scapula. Treatment consists in drawing the shoulder firmly backward and retaining it in position by the apparatus already directed for fracture of this bone. The *sternal end* of the bone may be displaced forward or backward and is occasionally thrown upward. Its luxation can be easily detected, and its management is to be the same as for fractured clavicle, except that the axillary pad is not always necessary. The coaptation of the parts must be preserved very carefully and for an unusual length of time; for the ligamentous reparation is slow and imperfect reunion will cause permanent deformity of the arm. Some surgeons treat dislocated (and even fractured) clavicle by confining the patient steadily upon his back, applying no apparatus and allowing no motion. Good success is said to attend such management.

Dislocation of the Pelvis.—Great violence may cause separation of one or both ossa innominata from the sacrum, or lead to displacement at the symphysis pubes. These accidents are very rare, fracture supervening upon violence more frequently than dislocation does. Luxation at the sacro-iliac junction is the more serious of these accidents to the pelvis, the force that caused the displacement being also generally sufficient to injure the pelvic viscera to an alarming extent. Inability to void urine, inflammation of the kidneys, concussion of the sacral nerves and internal suppuration, are not uncommon results of the injury. The displacement may be known from dislocation of the thigh by the natural position of the knee and foot, by the elevation of the crest of the ilium and by the limbs measuring the same from the anterior superior spinous process of the ilium, though one leg is evidently shorter than the other. Little can be done in treatment further than to evacuate the bladder regularly by the catheter, anticipate suppuration by the free use of lobelia in pill and mentha or eupatorium in infusion, and keep the patient quiet and in an easy posture.

Dislocations of the Upper Extremities.

Dislocation of the Humerus.—The humerus suffers luxation oftener than any other bone in the body, and Malgaigne has stated that, out of four hundred and ninety-one cases of dislocation, three hundred and twenty-one occurred to the humerus. It suffers displacement in the following directions: 1st. *Downward*, in which case the head of the bone is thrown into the axilla and rests against the inferior edge of the scapula. The shoulder is flattened, the arm lengthened, the elbow thrown slightly outward and the acromion projects prominently above a marked depression that is felt in the natural site of the head of the bone. The arm is motionless by the patient, but can be carried outward and rotated a little by the surgeon, when the head of the bone can be distinctly felt playing in the axilla; paralysis of the arm may be present, in consequence of pressure upon the axillary plexus, and edema of the hand may trouble the patient for a little time. Reduction may be effected by placing the patient upon his back and gently drawing the limb downward in a line with the body, at the same time fixing the surgeon's heel in the axilla for a pad and as a counter extending force. The arm is to be gently extended till the head of the humerus is dislodged from the scapula; and then the biceps is to be relaxed by flexing the forearm and the lower end of the humerus carried firmly over upon the breast. Another and equally efficient mode of reduction consists in placing the patient in a chair and using the surgeon's knee as a pad in the axilla. The operator places his foot upon the chair, brings the patient's arm over the knee and then makes extension upon the arm and carries it over the breast. Malgaigne was very successful in operating by carrying the arm directly upward over the head. Either method will secure the desired end, especially when the system has been relaxed by lobelia.

2d. *Forward*, in which case the head of the humerus is thrown against the inner side of the coracoid process, beneath the clavicle and under the pectoral muscles, resting against the second and third ribs. The arm is slightly shortened, the elbow thrown outward and backward and the head of the humerus can be distinctly felt under the clavicle. Reduction is effected in the same manner as in the first case, with the difference that extension is made backward and outward in order to free the head of the bone from the coracoid process.

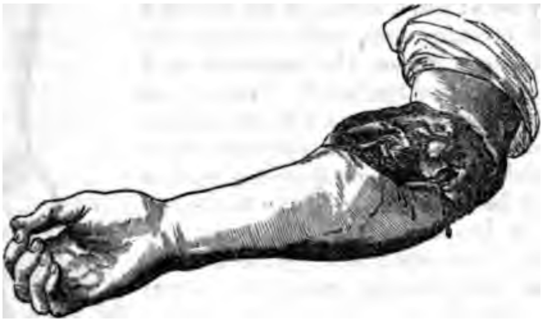
3d. *Backward*, when the humerus rests upon the dorsum of the scapula, between the infra spinatus and teres minor muscles. The bone can be distinctly felt in its abnormal position. The management is best conducted by lifting the arm upward and carrying the forearm behind the head, when a little extension upon the humerus (with a belt around the trunk and over the scapula) will bring the bone into position.

All dislocations of this bone are easy of reduction and it is but seldom that lobelious relaxation will be required. Its employment must not be omitted, however, in any case where the patient is robust and the muscles offer resistance to the coaptating measures. The arm should be bandaged to the side and supported in a sling for several days, or till the ruptured ligaments heal firmly. Compound dislocation of the humerus is a rare accident and seldom causes any serious difficulty, except when the axillary vessels are injured. Amputation at the joint may be then demanded. Luxation and fracture occasionally exist together, when reduction is very difficult, especially when the fracture occurs near the head of the bone. The luxated extremity must be first reduced and the fracture then attended to according to the ordinary methods.

Dislocation of the Radius and Ulna.—The radius and ulna are most frequently displaced backward, the coranoid process of the ulna falling into the olecranoid fossa of the humerus. The olecranon can be distinctly felt backward and above the condyles of the humerus, the forearm is flexed at an angle of about forty-five degrees and the trochlea of the humerus forms a round prominence under the tendon of the biceps. If the coranoid process is broken, the forearm is freely mobile; but if it remains sound, neither flexion nor extension can be performed. Reduction is readily effected by grasping the humerus with one hand and the forearm with the other and then forcibly flexing the joint over the knee, the knee bearing against the radius and ulna. The coranoid process is thus lifted out of its false position and carried upon the trochlea of the humerus, when the muscles of the forearm will at once carry it into place.

Lateral dislocation, both outward and inward, is sometimes suffered by both bones—the separation of the articulating surfaces not being complete. Reduction is accomplished as in the dislocation backward. The most serious difficulty at this point is compound fracture with dislocation, which frequently calls for resection of the bones of the forearm and sometimes makes a necessity for amputation above the joint. If the main artery is uninjured and the bone is not much comminuted, reduction may be performed, the soft parts properly dressed and the case treated as one of compound fracture. If the blood vessels have been injured, the soft parts greatly lacerated and the bones comminuted, successful recovery is doubtful. Yet good management *may* save the limb and the knife should not be resorted to hastily.

FIG. 41.



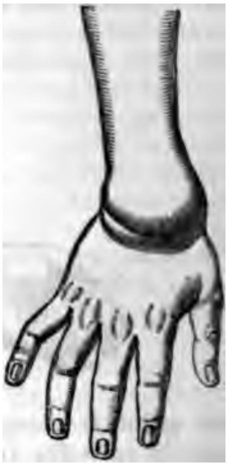
Compound Fracture of Elbow.—FERGUSSON.

Dislocation of the Ulna.—The ulna may be thrown *backward*, the head of the radius remaining in its natural position. The forearm is twisted and the hand pronated, the olecranon forms a distinct protuberance behind and the joint is flexed nearly at right-angles. Reduction is accomplished as in dislocation of both bones.

Dislocation of the Radius.—The radius alone may be thrown *forward* upon the external condyle of the humerus. The forearm is flexed a little, but can not be bent in consequence of the head of the radius striking against the humerus; the hand is held midway between pronation and supination, and the head of the radius can be felt in its abnormal position. The head of this bone may be also thrown *backward* against the external condyle, in which position it can be readily detected. Reduction is easily effected by making extension on the hand, and supinating the forearm in the dislocation forward and pronating it in the luxation backward.

Dislocation of the Carpus.—The carpus may be displaced either *backward* or *forward* upon the radius and ulna, or the ulna may remain in position and the carpus be luxated *backward* upon the radius alone. These displacements are quite rare and their possibility was, for a long time, doubted. They may be at once detected by the two unnatural prominences, and corresponding depressions, upon the anterior and posterior aspects of the wrist. Reduction is readily effected by simple extension. The carpal bones themselves are occasionally dislocated, the *os magnum* and *os cuneiformis* being most liable to this accident. The luxation is never complete, and the displacement is always backward, causing a prominence upon the dorsal aspect of the carpus. The wrist joint is always weakened, and permanent feebleness may result from dislocation of the os magnum, which has a strong tendency to redisplacement upon even ordinary motion. Management consists in pressing the bone or bones back to their places and retaining them there by a cushioned pad. Local relaxation by lobelia and the vapor bath may be required before reduction can be effected, and the maintenance of quiet in the parts is absolutely necessary for several weeks after the accident.

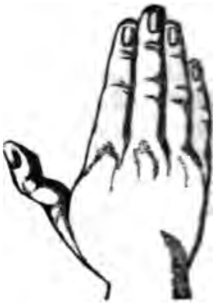
FIG. 42.



Dislocation of the Carpus.

Dislocation of the Phalanges.—The phalanges are seldom luxated, yet falls and blows upon the ends of the fingers may lead to their displacement. The nature of the accident is easily distinguished and reduction is readily accomplished by extension with a clove hitch made of a piece of tape. In the case of the proximal phalanges, however, especially that of the thumb when thrown backward upon the metacarpus, much difficulty has been experienced in reduction and it has been advised to practice tenotomy upon the parts in order to allow the bone to be returned to its place. Such procedure is unnecessary; for, by holding the hand in a

FIG. 43.



Dislocation of the first Phalanx of the Thumb.

strong infusion of lobelia for a few hours, sufficient relaxation will be produced to allow the bone to slip readily to its place.

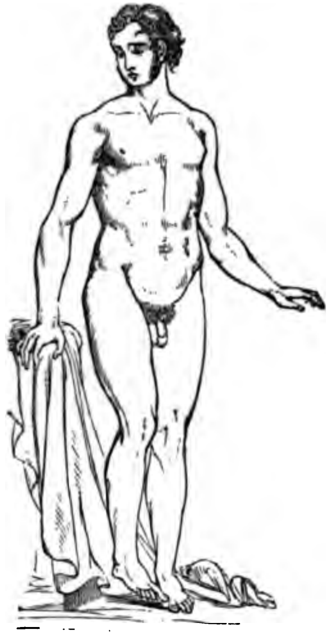
Dislocations of the Lower Extremities.

Dislocation of the Femur.—The femur, forming a joint of the ball and socket construction and having a long leverage, is very liable to dislocation, suffering from this accident more frequently than any other bone except the humerus. The number and power of the muscles connected with it and the obstacle to reduction offered by the rim of the acetabulum, conspire to render its luxation difficult to manage; and relaxation by lobelia and the vapor bath generally requires to be pushed for a considerable time before easy replacement is rendered possible. Under the relaxing mode of preparation, however, reduction of this bone is rendered very simple; while attempts to overcome the contractile power of the muscles by sheer force are often accompanied by serious injury to the parts and may ultimately fail. Four luxations are suffered, as follows:

1st. *Upward*, upon the dorsum ilii. In this form of the accident the head of the bone rests upon the gluteus minimus and in the shallow surface between the acetabulum and crest of the ilium; the great trochanter is turned forward and lies against the acetabulum, and the thigh and leg are both slightly flexed. As the patient stands erect, the limb is seen to be shortened about an inch and a half or two inches, the knee is thrown forward and inclines toward the other limb and the toes turn inward and rest upon the instep of the other foot. The head of the bone may be felt in its new position (when the parts are not too fleshy) and the limb can not be either abducted or everted. This accident may be distinguished from fracture of the neck of the femur by the absence of crepitus, limit of forcible motion and inability to restore the length of the limb at pleasure. Persistent *inversion* of the foot is also present in dislocation, while *eversion* characterizes fracture.

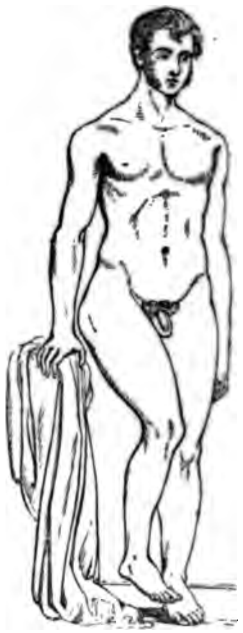
In attempting to reduce this luxation, the patient should be first thoroughly relaxed and then immediately placed upon his back on a hard couch. Let the surgeon then raise the knee, flex the leg partially upon the thigh, place one hand against the anterior edge of the tibia (near its head) and support the head of the femur by placing his other hand under the upper third of the bone. Then press the knee up steadily and firmly in a line with the sternum, till it passes several inches beyond the ramus of the pubes—at the same time keeping the head of the bone from falling down into the ischiatic notch. This motion gradually rotates the trochanter outward, changes the inverted position of the foot and brings the under surface of the neck of the bone against the rim of the acetabulum. When the knee has been thus carried upward as far as it can be, let it be pressed quickly and forcibly across the abdomen, gentle extension being made upon the limb at the same moment. This manipulation turns the ramus of the pubes into a fulcrum and lifts the head of the bone to a level with the rim of the acetabulum, when the combined influence of the muscles and the extending force will at once return the bone to its socket. This operation seldom fails, but may be repeated more firmly (the knee being carried upward and inward more forcibly) if the first attempt does not succeed.

FIG. 44.



Dislocation upon the Dorsum Ilii.

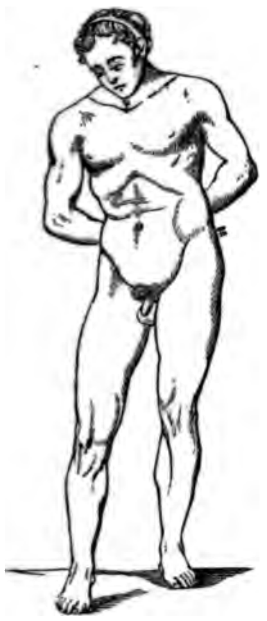
FIG. 45.



Dislocation into the Ischiatic Notch.

2d. *Backward*, into the ischiatic notch. There is but little difference between this and the former accident. The head of the bone rests upon the pyriformis muscle, touching the edge of the ischiatic notch and lying behind, and nearly on a level with, the acetabulum. The limb is shortened about half an inch, the foot is inverted and the signs are in all respects similar to those of dislocation upward. Reduction is effected by the same manipulations, but the knee can not be carried up so high and the bone has to be pressed very firmly across the abdomen in order to lift the neck of it high enough to let its head pass forward over the rim of the acetabulum.

FIG. 46.

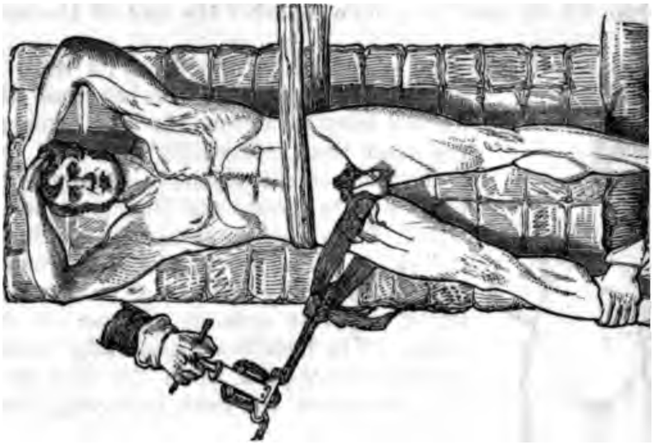


Dislocation into the Obturator Foramen.

3d. *Downward*, into the obturator foramen. The limb is lengthened about two inches and abducted from its fellow, the foot being at the same time pushed forward and the body inclined a little in consequence of tension of the psoas and iliacus muscles, which form a ridge along the inside of the thigh. The trochanter is depressed and is unusually distant from the anterior superior spinous process of the ilium. The luxation is generally caused by violence applied upon the foot at a moment when the limb is strongly abducted.

In reducing this displacement, the patient is to be laid upon his back and the limb gently and steadily extended by the hands of an assistant, counter extension being made upon the pelvis by a broad perineal bandage. When the head of the bone has been loosened from its abnormal position, the assistant is to draw the leg firmly toward its fellow (grasping the ankle for this purpose), the perineal bandage being shifted so as to draw the head of the bone outward. The pelvis may be also fixed against the power of the perineal bandage by passing a broad cloth about the crests of the ilii and drawing in the opposite direction. The amount of force required is not great, and the surgeon can easily procure reduction without assistance if the patient has been well relaxed. Another and similar mode of procedure consists in simple manipulation. The patient is placed upon his back, as before, and the leg is flexed upon the thigh; the knee is now carried firmly across the knee of the opposite limb and then pressed upward toward the innominatum of the sound side. These combined manipulations serve to lift the head of the bone out of the foramen, when the muscles of the thigh will at once draw it into place. A greater degree of relaxation is needed in this method than in the ot the femur is more likely to slip beyond the tuberosit ischium and fall into the ischiatic notch. The first procedure is, therefore, preferable when the surgeon

FIG. 47.

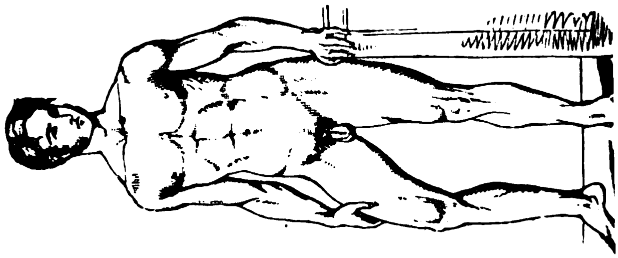


Reduction of Dislocation into the Obturator Foramen.

cure the aid of an assistant. The accompanying figur sents the first method of reducing this displacement, th and pullies, however, being entirely unnecessary.

4th. *Forward*, upon the ramus of the pubes, in whi of displacement the head of the bone lies under the ps iliacus muscles and outward from the femoral vess forms a round tumor above the level of Poupart's lig

FIG. 48.



The trochanter is rotated backward, the limb is sh about an inch and is abducted from its fellow, the kn thigh are both flexed a little and the whole limb is outward. In reduction, the patient is to be placed u back and, having been relaxed, the leg is to be flexed upon the thigh and then carried upward in a paralle the mesial line of the body. The smooth head of th is thus rolled over so as to rest upon the pubic branch. The knee is to be now slowly inverted and at the same time carried firmly across the body, just above the level of the symphysis pubes, when the bone will be entirely freed from the ramus and then at once drawn to its place by the muscles.

The ligamentum teres and capsular ligament are necessarily torn in all these dislocations, and more or less injury is done to other soft parts connected with the joint. In order to secure good reunion of the ligaments and future strength in the hip, the patient should be kept quiet for several days after reduction, and only allowed to use the limb moderately when he begins to move about. Dislocation may result from carious destruction of the rim of the acetabulum, as in morbus coxarius. Reduction is not then a matter of any importance, the disease of the bone and cartilages demanding the whole of the surgeon's attention. If the process of destruction can be checked, it is then advisable to reduce the displaced bone and retain it in its socket by suitable appliances; for the newly invigorated constitution may form new bone around the acetabulum, or build up a firm cartilaginous rim, thus ultimately securing a moderate degree of usefulness to the limb.

Dislocation of the Patella.—This bone may be displaced either *outward* or *inward* by direct violence. The leg is fixed in a state of extension, a depression is felt in the natural site of the patella and the luxated bone can be readily traced in its new position. Reduction is easily effected by laying the patient upon his back, relaxing the extensor muscles by flexing the thigh strongly upon the abdomen and then manipulating upon the patella and pressing it back into its place. The bone is also sometimes displaced *vertically*, one edge presenting against the skin and the other becoming wedged in between the condyles, in which position it can be plainly distinguished. The leg is extended and immovably fixed in this position. Reduction is generally rendered difficult on account of the tension of the ligaments and aponeuroses: and sometimes all attempts at replacement have failed and the patient has died from suppuration of the joint. But little can be dene till the system has been completely relaxed with lobelia and the vapor bath, when the bone may be raised outwardly by the surgeon's fingers and then brought to its place by flexing the knee.

Dislocation of the Tibia.—The tibia may be luxated either outward or inward, forward or backward. The breadth of the articulation, however, together with the support offered by the patella and its ligament, prevent complete displacement, and some portion of the articulating surfaces of the bones continues in contact in all cases except dislocation forward. In the dislocation *outward*, the inner articulating cavity of the bone is brought in contact with the external condyle of the femur; and in the dislocation *inward*, the outer articulating surface is brought in apposition with the internal condyle. The projections and depressions peculiar to luxations are very plain in both cases and the joint is somewhat flexed. Reduction is easily effected by straightening the leg and making gentle extension at the ankle. It is seldom that even coaptating manipulation is required, and the chief source of anxiety lies in the possibility of supervening articular destruction. To ward off the contingency of suppuration, the surgeon should insist upon quiet for a few days and apply relaxing washes upon the first manifestation of synovitis.

In the dislocation *forward*, the tibia and patella are raised up in front and the condyles of the femur pressed backward into the ham, impeding the circulation and lacerating the soft parts in the popliteal space. This dislocation is usually partial, but may be complete. The *backward* luxation of the bone is always partial; the head of the tibia forms a prominence in the ham, a marked depression is felt just under the patella and the condyles project in front. The knee is very slightly flexed and the limb shortened, in both cases. The bone can be replaced by flexing the thigh half way upon the abdomen and then making direct extension upon the ankle. The *semilunar cartilages* of the knee joint sometimes slip upon the articular surfaces of the tibia, causing the alar ligaments to be nipped between this bone and the condyles of the femur. A very sickening pain is felt in the joint, the patient can not bear his weight upon the limb, the leg is flexed a very little and is stiff and synovial swelling will be speedily provoked unless reduction is effected early. By forcibly bending the leg upon the thigh and then extending it quickly, the cartilages will be brought into place. A person who has once suffered dislocation of the tibia is always liable to a recurrence of the accident upon trifling occasions. It is very necessary, therefore, to be particularly careful in enjoining quiet upon the patient and to pay strict attention to the first symptoms of articular disease that may manifest themselves. If wound of the integuments should exist in connection with the luxation, the most scrupulous care must be directed to the strength of the system, the adjustment of the soft parts and the local medication. Amputation is not unfrequently demanded in compound dislocations of this bone.

Dislocation of the Astragulus.—The astragulus may be displaced inward, outward, backward and forward, all the luxations being generally accompanied by fracture of the fibula above the malleolus. When the articulating surface of the bone is dislocated *inward*, the foot is strongly everted and rests upon its inner edge, the malleolus of the tibia projects very prominently and the fracture of the fibula causes a distinct depression about three inches above the external malleolus. When the displacement is *outward*, the fibula may be luxated without being broken, the lower end of the tibia being then most frequently splintered. The foot is turned inward with the lower edge resting upon the ground, and the external malleolus is unusually prominent. Reduction, in both cases, is at once effected by making simple extension upon the heel and instep and then bringing the foot to its natural position. The joint must be carefully sustained for several days by splints upon the leg, quiet should be maintained, the ligaments may be strengthened by the treatment appropriate for sprains and sufficient time should be allowed for the broken bone to heal. Indeed, the fracture is the chief difficulty and requires the same management that has been already directed for solutions of osseous continuity at this point.

The astragulus may slip *backward* behind the tibia, the latter bone being thrown forward so as to rest upon the navicular and internal cuneiform bones. The heel is much elongated, the foot shortened and turned with the toes downward, the extremity of the tibia forms a strong prominence in front of the tarsus and the fibula is broken at the usual site. The capsular and deltoid ligaments are torn through, the other ligaments are greatly stretched, the skin is not uncommonly broken and the pain and suffering are more severe than in most other dislocations. Reduction is effected by extension and manipulation of the foot forward, the leg being flexed upon the thigh and counter-extension made upon the lower third of the femur. In many cases, however, this procedure is very difficult, the muscles offering such firm resistance that nothing but complete lobelious relaxation can bring the parts under the control of the surgeon. After the bones have been replaced, there is a very strong tendency to relaxation, which must be properly provided against by side splints along the leg, or by treating the case with the double inclined plane and foot board, as in fracture of the tibia. Two or three weeks are usually required for reparation of the fracture of the fibula, and the joint generally needs support for a couple of months. Friction with the hand, passive motion, local vapor baths and stimulating liniments, are commonly necessary to secure freedom of motion and usefulness of the parts. Compound dislocations at this joint are usually dangerous and require the use of the knife oftener than similar accidents in the upper extremities: yet the member must not be sacrificed rashly.

In rare instances, the astragulus has been known to be displaced from its tarsal as well as its tibial connection, being thrown forward from its position in the hollow of the scaphoid and os calcis. The bone is twisted either outward or inward and forms a distinct protuberance in front of the instep. The accident is generally caused by falls upon the foot when the toes are turned firmly downward. Reduction is effected by extension and manipulation upon the front of the displaced bone, the os calcis being drawn gently downward; but the patient must be completely relaxed before these attempts are likely to be successful. When this form of luxation is compound, especially when the tibial artery is also ruptured, amputation is scarcely avoidable. When the knife must be used, the member should be removed at a suitable distance above the malleoli.

Falls upon the foot sometimes force the astragulus upward between the tibia and fibula; and the bone may either lodge in that position, or spontaneously return to its normal site and produce no further ill effects than those necessarily following such an extensive sprain at this point. Reduction is easily effected and the strain upon the ligaments must be managed as has been elsewhere directed for such injuries.

The other *tarsal* bones, as also the *metatarsus* and *phalanges*, seldom suffer luxation. When any of them are displaced, the nature of the accident is sufficiently plain, and the treatment is to be in all respects similar to that for dislocations of corresponding parts of the upper extremities.

PART IV.

SPECIAL AFFECTIONS OF TISSUES AND REGIONS.

CHAPTER I.

HYPERTROPHY AND ATROPHY.

Hypertrophy.

RTROPHY is an enlargement of the substance of an in consequence of which the part attains an unusual A familiar instance is found in the increased dimen- f the muscles of a laboring man, whose exertions lead ugmentation of the local circulation and the deposition increased proportion of nutriment. This excess of may be brought about by the continuance of very pressure upon the return blood, the arterial flow being rupted. Any chronic excitation, by increasing the t of transmission through a part, may also become the of increasing its nutrition. The suppression of some secretions, as the catamenia, sometimes becomes the n of hypertrophy in some adjacent or distant organ; e uterus and mammæ have a temporary hypertrophy the periods of gestation and lactation.

enlargements are simply evidences of an excess of n. In this sense they can not be considered as any disease, but the great inconvenience they cause, and ger occasionally arising from their existence in par- positions, give them a surgical importance. Thus, ophy of the walls of the heart, by narrowing the of that organ, seriously interferes with life, through rded and interrupted circulation; hypertrophy of the also endangers existence, and hypertrophy of the he mammæ and brain, may entirely, or partially, in- with the functions of these parts. In the case of ophied thyroid gland (bronchocele) we have an in- of the unpleasant deformities which may be occasioned enlargements. These growths do not require any nt on their own account, but often demand to be re- in view of the secondary evils that may result from esence.

The heart, mammæ, thyroid gland, adipose tissue, l
ganglia, spleen, blood vessels and bones, are peculia
to become hypertrophied. The brain, nerves, skin
and other portions of the body, may be also affec
ligaments, tendons and serous membranes, seeming
only parts that do not thus suffer. Usually, the in
confined to a single part or organ, but occasionall
localities are affected at one and the same time.
was reported, many years ago, in which a young
hypertrophy of the face, tongue, neck, breasts, and, fi
the whole body. She came to measure five feet tw
in circumference; the mammæ almost touched the
the mouth was nearly filled by the enormous tongue.
revealed a corresponding enlargement of the heart,
brain was somewhat affected.

Hypertrophy may be confounded with simple tumo
which, however, it can be readily distinguished by t
ness of the affected part. When a tumor is develop
organ by fibrous, fibro-cartilaginous or any other org
deposition, it causes an enlargement of some partic
tion of that organ, not being at all inclined to as
form, or be limited to the outlines, of the organ itself.
a part is hypertrophied, it is almost invariably found t
the whole of an organ, distinctly following its form an
an outline exactly conforming with the original figu
part, the only difference in the part being its more bu
portions.

Management.—The only way, short of excision, i
we can hope to relieve a hypertrophied part, is by
the blood and the nutrition to some other portion of t
and then inducing such an activity of the absorbent
lead them to take up the excessive deposition. All
at destruction of the hypertrophy by the exhibitio
agent (as the mercurials) calculated to break down
tegrity of the structures, are not to be allowed or th
for a moment. Such a course is so evidently op
every principle of rational medicine, and may be
times productive of evils far greater than any suppos
to be derived from it, that it does not deserve a n
serious thought. We say "supposed good," for the
which are said to have been derived from such a p
exist rather in imagination than reality, there being
facts, touching its advantages, to entitle it to conside

One of the principle means upon which reliance
placed in the management of hypertrophy, is the va
This mode of applying heat and moisture relieves

ticular portion of the body from an excess of determination by inviting the blood to the surface, and this is one of the first ends to be attained. The vapor bath also loosens all the structures so as to remove all impediments to a free current; and, further, it is one of the most general and positive stimulants to the absorbent system that can be employed. Baths of this kind should be given every day, the temperature employed being moderate and the bath continued for a length of time. The patient should also use spikenard or sassafras tea while in the bath, these being good promoters of absorption.

Locally, the practitioner may use those agents which are known to act upon the absorbent system. Among these may be mentioned aralia, mentha, baptisia, absinthium and asarum. The essential oils of laurus, mentha viridis and absinthium (the latter in small proportions), may be formed into a liniment of moderate strength and the part bathed with it freely. Or mentha may be used alone; or any of the articles may be made into a poultice or fomentation and applied upon the hypertrophied part. Much perseverance is needed, months, and sometimes years, being required to remove the growths, and even then the practitioner may fail. Iodine, in some of its forms, has been employed as a means of promoting absorption, being exhibited both externally and internally. We may safely say that a hundred failures have attended one instance of success—a proportion which entitles us to refer the absorption to a spontaneous effort of the system and not to any aid rendered by the iodine.

It is not often that the knife is required in hypertrophies, yet it sometimes becomes necessary, especially in those cases where the enlargement is attended with much pain. The mammæ and testes sometimes require extirpation on this account, and bony hypertrophies may, in rare cases, call for an operation. Such necessities will be specially considered in coming chapters of this Part.

Atrophy.

Atrophy is the reverse of hypertrophy, consisting of a want of sufficient nutrition with consequent wasting and shrinking of the organ or organs affected. A portion of the frame may be thus deprived, or the whole body may suffer from emaciation.

The general character of atrophy may be understood by the following description of the wasting of old age, which we copy from Gross's Pathological Anatomy, page 89: "In the human subject, the body, after having reached the age of forty, begins to exhibit traces of decline. * * Examined at this period, the whole mass of the brain is generally diminished in size, the nerves have lost their moisture, and the ganglia connected with them are condensed and considerably shrunk in volume. The respiratory system experiences similar changes; the lungs are dryish, inelastic and increpitous, their volume is sensibly lessened, the walls of the air cells are attenuated, and whole lobules are sometimes deprived of their vesicular structure. The muscles of voluntary life are pale, flabby and diminished in bulk; the arteries, veins and absorbents, shrink in their diameter, and a large proportion of the more minute ones, becoming useless, are obliterated and lost; the lymphatic ganglions are hard, small, and many of them entirely disappear; the bones are spongy, brittle, and extremely prone to fracture; the ligaments are usually slender; the articular cartilages dry and attenuated; and the salivary glands, together with the liver, pancreas, spleen and kidneys, are indurated and considerably reduced in size. In the male sex, after the functions of the testicles have ceased, absorption frequently commences in these bodies, which shrink, become soft, pulpy, and are sometimes not larger than a French bean. * * In the female, the ovaries are pale, shriveled and frequently transformed into a condensed grayish substance; the mammæ are soft and flabby, with scarcely a trace of their original structure; and the uterus is hard, firm and diminished in volume."

These wastings of the organism can not be called disease, but are the inevitable results of the law of consolidation, which is a part of the human constitution. But when similar witherings occur before the time recognized as the ordinary period for constitutional decay, the failure is considered as disease, not being in harmony with the laws of the animal economy. The difficulty consists in a deficiency of nutritive supply, the waste being in excess. This wearing or emaciation of the body sometimes seems to result without any adequate cause, as in the case of Calvin Edson, the "skeleton man," who weighed but fifty-nine pounds, being over five feet seven inches in hight. His appetite was good, digestion apparently unimpaired and all the secretions normal. No apparent cause could be found for the dwindling of his body from one hundred and thirty-five pounds to the weight at which it was when he exhibited himself to the public. We recently met, in this city, a child of nearly three years old, who was no larger than most children are at six months. Its bones were well developed, the skin covered it properly, but muscles and adipose tissue seemed to be almost wanting. Its weight was not over fourteen pounds, and it got the name of "the spider," because of the great attenuation of its body and limbs. It could not walk, scarcely talked, ate ravenously, had perfect regularity of the bowels and kidneys, the only evidences of disease being an unbroken dryness of the skin and constant irritability.

But atrophy, as met with by the surgeon, can usually be referred to a definite cause. Thus, the long continued disuse of a limb, in consequence of confinement for fracture, dislocation and ulcerative destruction, or the same disuse from sprain, anchylosis, laceration or other injury, may leave it so enfeebled that it will be no longer able to continue the proper supply of nourishment, and withering of the extremity will be the unavoidable consequence. Or some injury to the nerves of a part (as severance, pressure by tumor or otherwise, ulceration, or functional incapacity) will so interrupt the channel for vitality as to leave the parts deficient in nutritive circulation. Or there may be a more direct interference with the circulation, as by occlusion of arteries from internal growths, by pressure from tumors situated externally or by direct ligature. Any of these several classes of causes must remain in operation for a considerable length of time before they will lead to any material degree of atrophy.

MANAGEMENT.—The management of atrophy may be in part surgical, though it is mainly medical. When anchylosis, the pressure of a tumor, or nervous interruption by the pressure of dislodged bone, are the continuing causes, they must each be remedied before the shriveled part can be expected to receive that supply of blood which will be necessary for its development. The joint must have its motion re-established, the tumors must be removed and the head of the bone returned to its place, if possible. These having been done, medical treatment can be resorted to with some hope of success.

The management then consists in the stimulation and relaxation of the parts, by which the caliber of the blood vessels may be enlarged and the nerves aroused to lend increased energy to the circulatory apparatus. Tincture of lobelia or essence of spearmint, may be made the foundation of liniments compounded of smaller proportions of such oils as origanum, hedeoma and absinthium. Tincture of capsicum and aristolochia may be also used as stimulants. Frequent local steamings with bitter herbs, as marrubium, eupatorium, absinthium, juniperus and others like them, will be found of great benef the baths being employed two or three times a day. The daily use of electro-magnetic currents through the part should also be added; indeed, every means calculated to bring the blood directly to the atrophied portion should be energetically brought to bear in such cases, and their use patiently continued for months, or years if need be. These cases very closely resemble paralysis, and their management is to be conducted on the same principles and by the same means directed for the latter difficulty.

CHAPTER II.

AFFECTIONS OF THE SKIN.

Tumors and Excrescences.

Encysted Tumor.—These tumors (called *Wens*) are usually situated upon the scalp, face and back, though sometimes found in the axillæ, groin and elsewhere. They present a smoothish and somewhat rounded surface, with well defined borders; are movable, seem to be situated immediately under the skin and seldom attain to a size larger than a hickory nut. They grow slowly, rarely suffer any pain or inflammatory action and are usually elastic. They consist of a well-defined cyst, containing creamy and curdy looking matter. The cyst is mainly of a fibrous composition, with a smooth lining of epithelium cells, and of various thicknesses, being sometimes very thin, when the tumor is generally fluctuating, at other times thick and hard, feeling almost like cartilage and resembling a horny growth. The contents of these tumors are subject to the greatest variations, being sometimes little more than water, at other times containing oil gloubles, or oily materials in stiffened masses like suet; a honey-like material has been found in some, and a ricey curd sometimes holds epithelial cells and oil globules. One or several of these cysts may exist at a time, it not being uncommon to find half a dozen together under the scalp. The materials composing them occasionally ooze out upon the surface, dry into a stiff brown scab which is pushed forward by a new layer of exuded matter, and in this way so-called *horns* are formed. In rare cases, these tumors proceed to ulceration, free circulation being retarded in them and their contents passing into decay. These ulcers may continue open for months together, sometimes spreading slowly, usually inclining to heal, but never being of any suspicious malignancy.

TREATMENT.—Early and complete excision is the only proper mode of procedure. No inconvenience may ever be suffered from their presence, but it is useless to attempt to remove them by medication. They may be emptied by making a very small puncture in their center and squeezing their contents out by gentle pressure, but are almost always sure to fill up again and grow larger and more rapidly than before. Extirpation removes them at once and completely, and they will not return. The operation consists in making one straight incision through the integuments, and directly over the center of the wen: the skin is then lain back, the cyst cut out and a stitch or two taken to bring the edges of the incision into place.

Fibrous Tumor.—A pure fibrous tumor consists of a mass of firm, yellowish-white structure, resembling the fibrous tissues of the body. When cut into, it presents many of the appearances of ligament, has a glistening look, shows a concentric arrangement of the fibers, and is occasionally found to contain points of ossification. These tumors contain few blood vessels; grow slowly, sometimes remaining stationary for years; attain to great sizes, often weighing fifteen and twenty pounds; present a distinct outline, and are rarely painful. They usually occur singly, the neck being a favorite situation for them, though tumors of the same character are found in the uterus and mammæ oftener than elsewhere. These enlargements eventually become edematous, the circulation is much retarded, serum may be also infiltrated, when the center of the tumor will soften, the whole mass will become semi-fluid and, ultimately, the integuments covering it will give way and present a foul and fungating sore. Hemorrhage from this ulcerous opening may occur upon the most trifling occasion; sometimes destruction advances slowly, sometimes rapidly by a series of small sloughs, the patient sinking from exhaustion. When the substance of the tumor is disposed to ossify, it may not ulcerate, but form into a chalky mass; and, in very rare cases, the fibrous deposits have been slowly absorbed, leaving a tumor that almost resembled a huge wen.

A *fibro-plastic* tumor (called also the *sarcomatous* tumor) is more granular and better supplied with blood vessels than the class just mentioned. Incision presents a smooth and somewhat elastic mass, semi-transparent and variously shaded, being pinkish, bluish or gray. The margins are not always so well defined as in the true fibrous tumor. They may also terminate in fungating ulcers, and are found to have a tendency to recur when removed. They have been known to re-appear in the same place as often as six times (after extirpation) and each time in a more degenerate form than before. On these accounts, they are occasionally classed as being of a semi-malignant character (see *Cancer*, p. 228).

TREATMENT.—Here, as in the other non-malignant tumors, extirpation should be at once practiced, and the earlier the better. The mode of removal will depend upon the situation. Nothing can be gained by delaying the operation; for medication cannot be at all relied upon, while time is almost sure to increase the growth to a most inconvenient size, even if it does not lead to destructive ulceration. If the practitioner is called after the process of destruction has commenced, he must treat it according to the class of ulcer to which it belongs. As it is likely to be of the low, fungating form, astringing stimulants will be required locally, and the strength of the patient must be well sustained by good vegetable tonics and a generous diet. The surgeon should not attempt to heal up the gap, but simply to stay the process of destruction and get the parts in a better condition, that the knife may be used as soon as possible.

Fatty Tumor.—These tumors are most frequently found under the cutis of the back and sides, though they may occur upon the face, scalp and extremities. They consist of masses of almost pure fat, most frequently resembling that found in the flesh of beef. The tumors are irregularly lobulated in form, contained within a cellular cyst and supplied rather freely with blood vessels, some of which will be large enough to require ligaturing upon removal of the mass. They are not painful, enlarge with varying degrees of rapidity, are movable under the skin, present a flat and more or less oval appearance externally, and give an inelastic, doughy feeling. They frequently reach a weight of two or three pounds, sometimes more, but occasion no other inconvenience than by their weight. Mr. Paget says (Surgical Pathology, p. 377) he has frequently observed them to glide from the place where they first commenced to grow, and mentions cases in which they shifted from the groin quite down upon the thigh.

TREATMENT.—Extirpation is the only effectual treatment. It should be practiced when most convenient, and by means of one free, full incision over the center of the tumor, ligating such arteries as demand it.

Subcutaneous Tumor or Tubercle.—This is an enlargement of the nervous extremities which lie subjacent to the cutis and seldom attains to a size beyond that of a pea; but it is extremely painful and sensitive to the least touch, and suffers from paroxysms of intense agony when wholly untouched. Such tumors are usually very movable under the skin, though occasionally attached to the cutis. They may appear suddenly or grow slowly, and are found at all parts of the surface. Extirpation by two elliptical incisions is the only way of obtaining relief. If any irritability of the system should remain after removal, the patient should be kept quiet and placed upon an infusion of cypripedium, scutellaria or mentha.

Horny Tumor.—This is a form of growth much talked about, but rather rarely met with. It usually results from the drying exhalations of the encysted tumor as has been already mentioned; though occasionally we meet with horn-like excrescences, on various parts of the body, which seem to have an entirely independent growth. They are always hard, generally of a dark color, and seldom supplied with either nerves or blood vessels. Two elliptical incisions at their base will remove them.

Warts.—Warts consist of projections of the cutis vera. They sometimes harden into senseless and dry elevations, as on the hands; or form soft, tender tubercles, exuding a contagious ichor, as in the flexure of the thighs and axillæ. They appear to rise spontaneously in some instances, and are found either singly or in crowds; though, more frequently, they follow some direct irritation. Upon the hands of children they come and go in great numbers; and some adults appear to have a predisposition to these excrescences. The warts about the penis and labia (following gonorrhea), belong to this class of affections.

TREATMENT.—When conical, they may be cut off with a sharp pair of scissors—other forms may be excised after the usual method employed for larger growths. They are very liable to re-appear, and there is a popular notion (and a pretty well-founded one) that the blood which comes from them will give rise to new warts on the skin when it spreads. It is well, therefore, to apply some gentle caustic to them after removing them; or they may simply be pared down, and then the caustic application made frequently till they disappear. The fresh juice of the Asclepiadaceæ is valuable for this purpose, but, being unhandy in some seasons and many situations, the extract of oxalis acetosella, sanguinaria or carya alba, may be used instead.

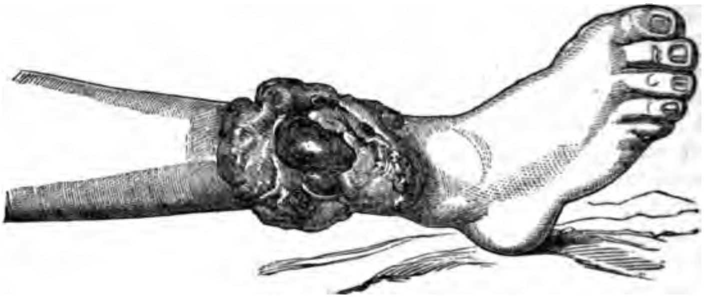
Corns.—Corns are such familiar pests of tight-shoed genti as to need but little description. They consist of har layers of cuticle, mostly situated upon some of the joints of the foot, where they become very dense and l like: at other times they are found between the toes, they are more spongy. They are the direct results of pressure and friction, and are always extremely painful.

TREATMENT.—First direct the patient to wear his shoes of ample size, of proper shape and of pliant leather. The feet should be then soaked in warm water every night and the outer crusts of the corns pared off with a sharp knife till they feel tender under the blade. A thin plaster of soap and sugar, of resin, balsam of fir and oil, or of beeswax, oil and frankincense, may be laid upon the corn and a piece of leather, punched out to receive the corn and support the pressure of the shoe upon the parts around it, may be worn through the day. A constant use of the pulp of a fresh lemon will be found of excellent service for the spongy corns between the toes. If an inflammatory action is set up and pus forms near the bone, relief can not be obtained till an incision is made and the matter let out.

Malignant Forms of Disease.

Cancer of the Skin.—Cancer of the skin is usually what is termed the epithelial form, the epithelial membrane being found to enter largely into the composition of the enlargement; yet a true scirrhus may be developed in the cutis, and the encephaloid tumor is occasionally met with. The cancer may begin as a small, hard, wart-like aggregation of scirrhous material, of an irregular shape and a reddish-gray hue. It is indolent, painless and stationary for a time—which may be sometimes extended to years. Ultimately it breaks out into a degenerate ulcer, which spreads rapidly and extensively. These ulcers have the foul surface, hard base and everted cartilaginous edges peculiar to the scirrhous form of carcinoma. In other instances the ulcers commence in the form

FIG. 49.



Cancer of the Skin.

of dark-brown, flattened and indurated crusts or scabs, with shooting pains and a growing incrustation. These are very slow in proceeding to ulceration; but when the process of decay begins, it proceeds very rapidly and is likely to soon destroy the patient. In rare cases, old ulcers and ulcerous fissures degenerate slowly and ultimately pass into a malignant difficulty that may be truly considered a cancerous form of destruction. They present a grayish sloughing surface and hard areolæ, discharge but little and are usually flat and spreading. The cutaneous cancers that begin in the two first forms are most frequently seated about the arms, the nose, the lips, the glans penis, or some other of the outlets of the body; those that begin in the latter form are oftener found about the feet, the thighs or other similar parts of the surface.

TREATMENT.—The management of cutaneous cancer is in all respects similar to that for cancer in general, as has been already directed. Those vegetable escharotics which will consolidate and destroy the dead tissues without injuring the living, and alkaline washes to keep a proper cleanliness, constitute the local means. The constitutional treatment is to be of the most thoroughly alterative character. If the difficulty is situated at a remote part of an extremity, it would seem advisable to amputate the part at some point sufficiently removed from the malignant ulcer. Two reasons urge to this procedure: 1st. The spread of the destructive process is likely to be rapid and death supervenes rather speedily. 2d. The constitution will be so little contaminated, that an operation is not favorable to the appearance of secondary tumors. Life, therefore, may be saved at the expense of a limb, but any operation less than that of amputation will probably be wholly useless. As in all other cases, the knife should be employed only after a due and energetic attempt at medication has proven insufficient.

Suppuration and Gangrene.

Bed Sores.—The simplest form of gangrenous destruction which falls under the notice of the surgeon, is that which results from long continued pressure upon a part by confinement to bed. Sloughs may result from such deprivation of nourishment, even in the most healthy constitutions: but it is in those of weakly frame, depressed vitality or vitiated blood, that these sores most frequently occur. They are usually found over the sacrum, trochanters, olecranon, crests of the ilii or some other position where there is but a thin integument over a bony prominence upon which pressure is likely to be made while the patient lies on his couch. The styloid projections of the radius and ulna, the malleoli and even the tendons and bursa of the os calcis, are at times destroyed in a similar way—the feebleness of the arterial effort and, perhaps, a paralytic tendency on the part of the whole body, favoring the accession of stasis and gangrene, even when the actual pressure is but that of ordinary confinement by a splint or in a sling. Under such circumstances, the subcutaneous tissues will become soft and doughy, the skin will present a reddish-brown or greenish-yellow hue, and a slough will pass off in the midst of a thin, ichorous exudation. From the peculiar position of such sores, exposition of the tendons, fascia and bones is a common result of the slough; and these structures are, in their turn, liable to decay by a continuance of the pressure—the destruction at times extending to considerable distances. The intractability of these sores makes them extremely annoying to the surgeon, who sometimes has the sorrow of seeing his patient sink from the exhaustion of discharge and irritation.

TREATMENT.—Prevention is better than cure, and the surgeon must always be on the alert to guard against these accidents. He should, from the earliest moment, take every precaution against the evil influences of pressure in those patients who are likely to be confined to their bed for several weeks by any surgical difficulty. As Erichsen so judiciously advises (p. 349), "Steps should be taken by proper arrangement of the pillows, and by the use of the water bed and cushions, to prevent pressure being injuriously exercised on any one part. At the same time, cleanliness and dryness should be carefully attended to by proper nursing, by the use of a draw-sheet and by furnishing the bedstead with the necessary arrangements of the bed pan, etc." The parts themselves should also be relieved from the pressure, by changing the position of the patient and undoing splints and bandages as often as an observance of other surgical principles will permit. Friction over them should be practiced from the very first: but when congestion has taken place, it should not be employed, a very weak wash of cayenne, myrrh or xanthoxylum, being used in its stead and a soft plaster of honey and balsam of Peru, on fine leather, placed over the exposed parts. Such precautions will prevent all unpleasant consequences of confinement in the majority of cases. The hydrostatic bed should be employed when possible.

If the part sloughs, the removal of pressure is imperative, for the danger to be apprehended from an extension of the decay is greater than almost any other. Light and soothing dressings are to be employed, as any of the balsams made thin by the yolk of eggs and spread upon lint. The general health, too, must be well and carefully sustained by every means that hygiene and medication can bring to bear.

Anthrax, or Carbuncle.—This is a local destruction of cutaneous and areolar tissue, usually depending upon an accumulation of morbific materials in the part, and presenting a greenish-purple hue surrounded by an irregular livid tinge of partial congestion.

Carbuncles are flat, of a doughy feeling, accompanied by an intense smarting pain (always circumscribed), and varying in size from a hickory nut to a dinner-plate. They most frequently occur over bony surfaces, as over the scapula and upon the posterior portion of the neck, dorsum of the feet and hands, &c.; never form a pointed elevation, though slightly raised above the surrounding surface; and are not accompanied by a lively arterial resistance. A very feeble grade of constitutional opposition is established, the pulse being of the typhoid character and the tongue unpleasantly furred. The countenance is usually sallow from the first. As decomposition advances, the skin gives way, showing an irregular undermining of the subcataneous tissues. The sloughs are usually small, detached independently of each other, of an ashy-gray, or whitish-green color, and accompanied by a small discharge of sanious ichor. The advance of decay is usually slow, and the system suffers much from the influence of the unseparated putrefying mass; and sometimes the patient sinks into the grave with premonitions of hiccough, delirium, cadaveric countenance, thready pulse and coma.

Gangrene most commonly occurs on those in advanced life, where the system is filled with morbific materials and the constitution has suffered from disease or intemperate excesses of eating and drinking, or from impregnations of calomel.

TREATMENT.—Clear out the foul origin of the difficulty by thorough emetics, daily bathings (especially the vapor bath) and the free use of stimulating alterants, as smilax, stillingia and rumex. Sustain the constitutional vigor by the exhibition of hydrastis, gentian, cinchona, aletris and similar stimulating tonics. Pay the closest attention to the prima via, unloading the lower bowels regularly by enemas of a character suited to the case, and relieving the upper portion of the canal by moderate quantities of leptandra with capsicum-apocynum. Avoid purgation. Secure a healthy loca bracing air and wholesome diet.

To the carbuncle itself, apply the knife early and with freedom, making crucial incisions through its whole length and breadth, that the decaying masses may have every opportunity for escape. Delay jeopardizes the safety of the patient by permitting the possibility of absorption and risking the spread of decomposition by the influence of putrescent contact. Incisions having been made, apply stimulating and astringing poultices, as capsicum and myrrh added to nymphea odorata, or myrica or rhus glabrum bark with bread and water. These will arouse the adjacent structures to a lively action and thereby secure the full detachment of the decaying portions. When the sloughs have been removed, a granulating surface will be found below, usually tending to heal, when all that will be required will be the simple dressings described for the healthy sore.

Boils.—These are, in many respects, analogous to carbuncles, but are not of so degenerate a character. They consist of hardened abscesses, mostly commencing in the subcutaneous tissues, and accompanied by a strong tendency to congestion. They are of a flatly conical shape, enlarge slowly and are extremely painful. When they burst, or are opened, the pus discharged is usually thick, more or less streaked with green and rather fetid. A small, hard slough of cellular tissue (known as a *core*) is usually found embedded in the boil, and the gap rarely heals up till this has been removed.

Boils make their appearance in all classes of people and at all periods of life, though they are most common with the young, or with those who have lived on a free animal diet. The plethoric are liable to them, and it is also a very common thing to find numbers of them appearing during convalescence from long febrile attacks, as from typhus and variola. Persons who have undergone a rigid course of hydropathic treatment are also very liable to whole "crops" of these suppurations. They deserve to be looked upon as so many evidences of nature's attempts to rid the system of impurities. They are very painful and troublesome, and sometimes follow after one another, crop by crop, to the great misery of the patient.

TREATMENT.—Constitutionally, employ repeated vapor baths and active alteratives, keeping the bowels perfectly free by daily enemas, and the liver active by leptandra, juglans or apocynum. By these means the morbific materials will be carried out through such a multiplicity of channels that they will not be left to accumulate in spots and cause destruction of tissue. Poultice the lumps with linum, or ulmus, and lobelia. As soon as there is the least evidence of pus, open them freely, and then treat them as abscesses. Being usually of a degenerate character, such articles as cornus, nymphea, prunus and rhus cortex, or even capsicum, xanthoxylum or myrrh, may be required to sustain a full circulation, prevent further sloughing and aid granulation. The practitioner will find a guide to govern him in his applications, under the heads of *Ulceration* and *Abscess*.

CHAPTER III.

AFFECTIONS OF MUSCLES, TENDONS AND BURSÆ.

Muscular Contractions.

CONTRACTIONS, or persistent shortening of muscles, is often a congenital difficulty, giving rise to various deformities, as squint eye, club foot, wry neck, &c. These will be referred to in their appropriate places, this section being intended to embrace only those contractions which follow various accidents and influences not congenital, nor referring to the above special deformities. A variety of circumstances may lead to contractions of this kind, as: 1st. When a dislocation or fracture has remained unreduced for a length of time, the muscles acquiring a new direction of action and holding the parts from their proper places. 2d. When a part has been kept unduly flexed, as is sometimes seen in those who have been long confined to bed, holding their limbs improperly bent; in persons who have stood too long in one attitude and in those who, on account of some accident, have had a limb held in an improper position by bandages. The flexed muscles become rigid, giving a false position to the parts, crippling the motions and often causing constant aching pain, as in cases of cramps.

TREATMENT.—When the contraction is connected with a fracture or dislocation, the displaced bones must be brought to their places as soon as possible; to aid which, relaxation by lobelia and the vapor bath will be required, as has been already directed for these accidents. The same means are to be used in the other cases of rigidity, small quantities of strong infusion of lobelia being administered internally, a mild vapor bath given and the parts wrapped with lobelia fomentations or flannels wrung out of lobelia tincture. In the great majority of cases, these means will secure the desired end, but sometimes the muscles remain stiff in defiance of any legitimate degree of relaxation that can be used. When this is the case, a system of forcible extension is to be employed, the limb being straightened as far as possible and then an apparatus adjusted, as in anchylosis, to hold it to the position to which it has been brought. In twelve or more hours, the extension may be renewed, always applying it to the degree that the limb will bear without being really uncomfortable, and carefully retaining, from time to time, the advantages gained upon each occasion. Relaxing and stimulating embrocations may be used in connection with the extension. Cases of long standing and great obstinacy have, by this simple process, been reduced to normal straightness and pliability in a few days.

Atrophy of Muscles.

By disease or disuse, the muscles of any part of the body will become atrophied—sometimes rapidly, at other times slowly. They are soft, shrunken and incapable of strong motion, the circulation through them being feeble and the warmth and sensation of the superimposed integuments falling below the normal standard. In short, this difficulty resembles paralysis in all respects, arising from the same influences and being amenable to the same treatment. Washes of cayenne, aristolochia, absinthium and other stimulants, local vapor baths medicated with spruce, hemlock, wormwood, origanum or marjoram, friction with the hand and stimulation with the electro-magnetic current, comprise the most efficacious means that can be used.

Rupture of Muscles and Tendons.

Both muscles and tendons are liable to be partially or completely ruptured by sudden and violent contractions, as during leaping, dancing and lifting heavy weights, or they may be severed by some simple mechanical accident. The gastrocnemius, biceps flexor cubiti, quadriceps extensor femoris and recti abdominis, most frequently suffer this form of accident. The point injured is usually that where muscular fiber ends and tendon begins, though the body of a muscle and the center of a tendon may be the seat of rupture. The patient is made aware of the injury by sudden loss of motion in the part, preceded by an audible snap and followed by keen pain. The part becomes swollen and discolored by extravasated blood; a gap is at first plainly discernable at the point of the injury, but the deposition following inflammation soon makes a hardened lump, or callus. Lameness will last till the damage has been repaired; or even for life, if the part has not been held in proper position during the process of reunion.

MANAGEMENT.—Flex the limb till the severed ends of the muscle or tendon are brought into apposition, and then keep them there by any simple and appropriate contrivance, enjoining the most positive quiet upon the patient. If the limb is kept straight, or if it is extended during the process of reparation, the muscle will be elongated and rendered partially useless during life. If the gastrocnemius is injured, a loose shoe may be worn upon the foot and the heel connected with a firm bandage fixed upon the lower third of the femur. If it is the recti muscles that are ruptured, the body must be bent forward and kept in that position either by suitable stiff splints to the spine, or strappings from the shoulders under the perineum, carrying the bands over the abdomen. Similar accidents in other positions can be met in the same way by bandages and straps carried in directions to suit the nature and position of the parts. If it is an extensor muscle that is injured, the limb must be kept straight instead of flexed. From eight days to two weeks may be required for firm reunion. Ardent inflammation in the part may be relieved by cold water dressings or washes of lobelia infusion. If congestion supervenes, washes of polygonum, arum, aristolochia or other gentle stimulants, may be employed.

Inflamed Bursæ.

The bursæ are sometimes injured by hard and frequent pressure, when inflammation will be set up, the part becoming painful, red and swollen, as in other similar cases. House-servants are most liable to this accident, which is so often witnessed in the knees of scrubbing girls as to get for it the familiar name of *house-maid's knee.* The bursæ at the elbow joints of miners are often injured in the same way, getting the name of *miner's elbow.* The difficulty may be distinguished from injury and inflammation of the synovial membranes by its superficial position, lying *in front* of the patella and *over* the olecranon; whereas, in synovitis, the difficulty is plainly discerned to be *under* the patella and *beneath* the olecranon. Yet, in this respect, it is a matter of small importance which of the structures is thus affected; for, as inflammation is but a vital effort established to resist and remove injuries, it is t same thing in all situations and always requires the same laxing and cooling course of management.

ENT.—Rest and envelops of cool water, of
r of ulmus and lobelia in poultice, will be s
y is seldom so great as to obstruct the flow
extent as to favor suppuration; but if th
ngestion threatens such a result, stimulants
polygonum, abies canadensis or capsicum,
a wash with lobelia and used freely till th
nflammation returns. The bowels should
aded by enemas and proper doses of lepta
, and general disturbance of the circulation
y drinks of weak zinziber, asarum or ascle
th a lobelia pill occasionally. Fluids may c
the [illegible] e management of which
next [illegible]ing.

Bursal Enlargements and Ganglia.

The bursæ are subject to enlargements, usually
about by continued irritation from friction, a more or
dent degree of inflammation being present. These
ments are usually soft, the bursal structure being di
into sacs filled with thin, straw-colored, serous fluid, an
ing an ovoid, indolent, fluctuating ganglion. Again,
may contain a more viscid fluid and shreds of semi-ca
ous materials, when the enlargement will have a mo
feeling; and sometimes, by long continuance of the p
they form almost solid tumors, as is most familiarly
bunions about the great toe. These more hard tum
apt to be quite painful, a constant inflammatory acti
render them hot and tense, and the superjacent integ
usually have an edematous appearance. They frequen
purate, forming abscesses after the usual manner and
ordinary symptoms. The pus is usually thick and
less intermixed with shreds of bursal tissue in a half g
ous condition.

TREATMENT.—In the ganglionic enlargements of burs
inflammatory action does not exist, the emptying of
is the first and most important point of the treatmen
this purpose, a very sharp-pointed and grooved need
be introduced under the skin and then gradually pus
ward the sac with an augur-like motion. The wound
skin should be as small as possible. What fluid does
cape with the needle will pass into the cellular tissue
absorbed. If a considerable inflammatory action e
should be quieted by appropriate poultices before the

tion, and the same softening and cooling course must be energetically pursued as in bursal inflammation, whether the enlargement is hard or soft, operated upon or not. Where the continuation of pressure keeps up constant annoyance, as in the case of bunion, the pressure must be at once removed and the utmost freedom given to the part. If pus forms, it may be discharged by a free puncture (direct or indirect, as may be deemed best fitted to particular cases), and then the case managed as in ordinary abscesses. In general, it is difficult to secure good granulation and a full obliteration of the cavity. When there is any tardiness in this matter, a mild infusion of polygonum, cornus, aristolochia or capsicum, may be injected into the cavity. This will soon prove efficient in arousing good reparative action. The practitioner is to exercise prudence in the use of these agents; for, as there will be no necessity for them when a full granulating effort is established, it is a blamable act to continue their use till painful sensibility is excited; and though an unsuccessful effort at reparation will call for such stimulants, they are then to be used only in a mild degree and time and patience allowed for the filling up of the cavity. When the enlargements attain the solidity of tumors, they may be extirpated by incisions, care being taken to disturb the faciæ of contiguous tendons as little as possible. It seems preferable, however, to not use the knife at all upon these enlargements, but to be content with alleviating the inconvenience of their presence by suitable relaxing and emollient applications and the allowance of abundant room, that they may not continue to be irritated by pressure.

Ganglia of the Tendons.

These consist of accumulations of straw-colored serum, forming either in small cysts upon the sheaths of tendons or within the sheath itself. Their most common seats are the back of the wrist and the front and back of the hand. They form smooth tumors, which are elastic, globular and circumscribed when in the form of cysts; irregular, large and extensive when within the tendinous sheaths. Sometimes they are attended with great pain and some inflammatory action; at other times they cause but little pain and increase so slowly that vital resistance is not aroused. Occasionally their contents are dark and grumous, when there is a tendency to decomposition, an erysipelatous quality of inflammation will be excited and suppuration, or a low form of ulceration, may supervene. They always occasion pain and feebleness in the parts below them. When situated within the sheaths of the flexor tendons of the wrist, and extending above the anterior annular ligament, they prove very troublesome.

TREATMENT.—The contents of the ganglia should be let out by a valvular or side incision, a small grooved needle being used for the purpose. Let the opening be quite small and every care taken to not allow the introduction of any air. Pressure will usually be required to force out the contents through the groove. After the enlargements have been thus reduced, the parts should be snugly bandaged, a wash of such stimulants as hemlock, wormwood, origanum, xanthoxylum and similar terebinthenæ, being applied several times a day. The general health should be carefully regulated at the same time, the alvine canal being kept free, the system rid of impurities by the use of alterants and the digestive apparatus well braced by tonics. It is sometimes very difficult to overcome the tendency to these serous accumulations, and excision of the sacs has been recommended. We would prefer to reopen them several times, if necessary, and then trust to time and constitutional medication.

CHAPTER IV.

AFFECTIONS OF THE LYMPHATICS.

Inflammation.

Acute Inflammation may be set up in the lymphatics in consequence of: 1st. The absorption of poison, as in bubo. 2d. Violence, as blows. 3d. Constitutional impurities and lodgment of unwholesome materials. 4th. Punctures, putrid inoculations and other similar injuries. When the vital effort is established to resist a local accident, the lymphatic glands will at once begin to enlarge, feel hard and tender, become red and manifest all the ordinary signs of inflammatory action. If poisonous absorption is the difficulty, a red line along the course of the subcutaneous lymphatics will mark the progress of the virus toward the glands. The vessels are hard, cordy and painful, as is frequently seen in syphilitic cases and accidents from dissection wounds. It is only in severe cases that the virus reaches the lymphatic ganglia, which swell greatly. The patient usually suffers rigors at first, and then an ardent febrile excitement; erysipelas may mark the course of the poison, and the injured vessels become a hard, purple band; the limb affected may become edematous; and vomiting and diarrhea, with ultimate prostration, denote that the poison has reached the system at large. Suppuration may follow these accidents, as in all other cases of local injury. When destruction of tissue does occur, it is usually limited. The inflammatory resistance may be so crippled as to assume an erysipelatous form, when vesication may follow, if the difficulty occurs in the external lymphatics, or diffuse abscess, when the deeper vessels are affected. But more commonly the difficulty is overcome and the inflammatory effort subsides in a few days.

TREATMENT.—Poultices of lobelia and ulmus should be applied to the affected parts, and irrigation with cold water may be also employed. Quiet and a recumbent position must be enjoined, the bowels unloaded by enemas, teas of salvia, asclepias or asarum, administered and a pill of inflata given occasionally. General sponge baths may be used when the case becomes bad; and attempts at vomiting indicate the exhibition of an emetic. Diarrhea is to be managed by such astringing enemas as hamamelis and rubus in some convenient demulcent, zinziber being given to drink and the stimulating vapor bath being used. Abscesses are to be opened early and by a small puncture, the after treatment being in accordance with the rules already directed for *Abscess*. If an erysipelatous condition exists, the same course of management is to be adopted as for erysipelas in general. Edema is best relieved by vapor baths and washes of aralia, vinegar and water, and other agents which relax the lymphatics and aid the passage of the fluids. If, when the inflammation has subsided, the limb should still remain dropsical and cold, washes of aristolochia, friction, gentle bandaging and the internal use of such stimulating tonics as hydrastis, aletris and populus, will soon restore both the sanguineous and lymphatic circulation. Reparation advances from the bottom of the sore and proceeds rapidly or slowly, according to the vigor of the frame and the purity of the blood. Cleanliness is to be practiced and the opening of the cavity kept apart, that the purulent material may escape freely.

Scrofula and Cancer.

These, especially scrofula, frequently attack the lymphat glands. The neck and axillæ are most liable to become affected and all the glands in a ganglion are usually in cated. Diagnosis, together with the proper treatment, will be found under the appropriate heads in Part II of this volume.

Fibrous Tumors.

These tumors occasionally affect the lymphatics, but usually confine themselves to a single gland, by which circumstance they may be readily distinguished from scrofula and cancer. They grow slowly and steadily, being thus different from scrofula, which swells and subsides in paroxysms under the influence of favorable or unfavorable circumstances. Tumors may be extirpated by an operation suited to the locality in which they are found; though, as a general rule, the knife should be used only when one or two glands are affected, when the surrounding glands remain wholly unimplicated and when the enlargement is so considerable as to be decidedly inconvenient. It is improper to use the knife rashly for extirpation of tumors in these parts.

CHAPTER V.

AFFECTIONS OF BONE AND PERIOSTEUM.

Hypertrophy.

ALL the bones of the body are liable to hypertrophy, though the tibia, femur and superior maxillary, suffer oftenest. The increase of organized deposition is usually upon the surface of the bone, increasing its circumference, not at a circumscribed spot or in the form of a simple tumor, but along most of its whole length, the limits of the hypertrophy becoming gradually lost in the surrounding structure. Yet many instances occur in which the increase is in the length of the bone. The limb thus affected will be so much longer than the other as to make an actual deformity and may be confounded with hip disease when the lower extremities are thus elongated—a mistake in diagnosis which may be almost confirmed by small ulcers and osseous exfoliations accompanying these hypertrophies. The fact that hypertrophy proceeds very slowly, is entirely painless and does not involve the superjacent soft structures, will serve to distinguish it from morbus coxarius.

TREATMENT.—The medical treatment is not very satisfactory, and the chief question relates to the propriety and benefit of excision when the bones of the face are affected. Being painless, no part will for a moment allow the question of removal except when the threatened deformity is very great. Yet it is well for the practitioner to place the health of such patients in the best possible condition, to open and arouse all the secretory organs and, as a scrofulous constitution is a very common accompaniment, to rid the system of all such impurities. By these means the growth is often stopped and further deformity prevented. When hypertrophied lengthening of one lower extremity leads to relative shortening of its fellow, a thick soled and high heeled shoe may be worn on the latter.

Atrophy.

Atrophy of bone, like hypertrophy, may be either in the length or circumference of it, especially the latter. The parts may diminish in size, which is most common; but in some cases the cells widen while the lamellated structure becomes thinned; and again the whole inner portion of the bone may be wasted by absorption, leaving the outer part like an osseous cylinder. In all cases, the strength of the affected bone is diminished so much that it is liable to be fractured by the most trifling violences; the bone sometimes becomes so softened that it can be readily cut with a pocket knife. The part is always weakened by such deficiency in growth and deformity sometimes follows it, as lateral curvature of the spine when the femur is shortened by atrophy. The causes of atrophy may be: 1st. General deficiency of nutrition in consequence of a scrofulous diathesis and a rickety tendency. 2d. Interruption of the circulation in the medullary arteries, as from fracture of the femur or tibia below this artery, or of the humerus above it. 3d. Want of sufficient action in consequence either of long confinement, paralysis or anchylosis. 4th. Osseous abscess.

TREATMENT.—The re-establishment of nutrition in a bone in which it has been interrupted can be accomplished only by a general invigoration of the constitution, the establishment of free action in the secretory organs and the relief of any existing paralysis, anchylosis and fracture, as far as is possible. If the patient is of a scrofulous diathesis, the constitutional treatment appropriate to scrofula may wholly relieve the atrophy. In case of rickets, the management must be of the character to be recommended for the latter affection. It is difficult to restore an atrophied bone and the practitioner can seldom do more than arrest further withering; yet, by the long continued use of such medical and hygienical means as are best calculated to purify the system and establish free functional activity, the size and strength of the bone may be in part restored, especially in young and robust persons.

Periostitis.

Inflammatory action may be provoked in any part of the periosteum by external violence, lodgment of mercurial globules, general mercurial taint and syphilitic inoculation. The difficulty against which the vital effort is directed may be confined to the osteal covering, or it may extend to the bones and superimposed soft structures. As a consequence, the inflammatory action is commonly found to also extend to the parts adjacent to the periosteum, and sometimes the difficulties are of such an extent that the entire thickness of a limb may be engaged in the vital manifestation.

Periosteal inflammation of an acute grade is accompanied by intense pain, which is greatly increased when the bone is implicated. There are, generally, remissions of the pain during the day and exacerbations through the night. The skin is not involved at first, but remains pale and loose; while a distinct, hard and deep swelling is plainly appreciable to the touch and the least pressure causes an increase of the misery. In the course of some days, or even in a few hours, the soft structures participate in the inflammatory effort and become tense, red and swollen, being also extremely tender. The obstructions may be so great that the most ardent vital effort can not remove them, when destruction of tissue will commence and an abscess or ulcer be formed, the bones being usually implicated and the destruction advancing very rapidly. Under these circumstances, the patient soon sinks into hectic. Or the obstructions may not be sufficient to lead to destruction and, being partially overcome by the inflammation and suitable medication, will provoke a low grade of vital resistance, constituting a chronic case.

Chronic periostitis is by no means as painful as acute, and the adjacent tissues are seldom concerned to any extent. Plastic effusion takes place under the periosteum, in which position it may become firmly organized, forming hard tumors or nodes. Or the membrane itself may be thickened by fibrous infiltration, leading to extensive indurations, in which enlargements the bones may participate. When the periosteum near a joint is thus provoked to inflammation, the contiguous synovial membranes may take part in the action. These enlargements are usually quite tender upon pressure and the pain in them is greatly aggravated during the night. Chronic periostitis may affect nearly the whole skeleton at one time, though such exposed localities as the tibia, cranium and ulna, are peculiarly liable to it. In scrofulous persons, it occurs most frequently about the joints of the extremities; in children, the carpal and tarsal phalanges are favorite seats.

TREATMENT.—Relaxation is called for in these as in all other cases of inflammation, with the single difference that the dense character of the periosteum demands an almost incredible amount of the relaxing agents. The parts themselves should be enveloped in ample poultices of lobelia seeds with enough ulmus to make them properly glutinous. We have pursued the course of wrapping the patient in a strong lobelia wet-sheet every day, besides applying the lobelia poultices. Pills of lobelia extract may be given with the utmost freedom, and enemas of strong lobelia infusion should be repeated every hour or two. Yet the practitioner will scarcely be able to secure more than a moderate degree of pliancy in the textures, and days, or even weeks, of this thorough medication may be required to loosen the structures to a degree that will allow the escape of obstructing materials and put the parts beyond the danger of destruction. Till this end is accomplished, and while the intense pain and strong vital action last, this treatment must be pushed without any abatement; for it is the only mode that will meet the necessities of the occasion. If the patient vomits a few times under this management, it will be altogether the better for him: indeed, an emetic should be purposely given whenever the tongue is furred, for a large amount of morbific material is always found in the system. If suppuration commences, the pus should be let out by a pretty free incision direct to the bone. If the pulse becomes thready and the patient very irritable, a relaxing emetic must be insisted upon, and such mild aromatics as asarum, mentha or zinziber, given in weak infusion; for the patient is then becoming typhoid and needs the course of management already directed for that condition. If hectic sets in, the strength must be sustained by tonics during the febrile remissions and the arterial system loosened and sustained by drinks of aristolochia, zinziber, polemonium or eupatorium ageratoides, during the exacerbations; the affected part must be attended to at the same time, and all pus and decaying portions of bone removed as early as possible. As caries and necrosis nearly

always commence with, or are accompanied by, acut
ostitis, he more minute considerations in treatment
deferred to the sections upon those subjects.

In chronic periostitis, the system must be energ
ed by the use of stimulating alterants in com
vapor baths, fresh air and a wholesome diet, ai
tinence from every species of alcoholic and n
ery. Where the nodes follow secondary syphi
ate management will be found under that
he whole difficulty is chiefly due to mercurialis
hemical bath must be used in conjunction witl
s where the periosteal enlargement is
not dependent upon either syphilis or m
has followed slitting of the thickened mer
of a small tenotomy knife introduced unc
n. evering medication is very necessary to e
cure.

Ostitis.

Inflammatory action in the bone may be establis
resistance to mercurial or syphilitic contamination, c
voked by external violences, as in periostitis. Its syn
are also of the same general character, and the two
always exist together and can not be distinguished, exc
the greater intensity of the pain in ostitis. Caries and
sis are most likely to ensue when the inflammation is
lished in opposition to affections in the bone alone.
treatment of ostitis is in all respects the same as for per
and will require to be pushed with the same earnestn
the tissues may thereby be sufficiently loosened to all
escape of the offending materials and the danger from
cal destruction be thus averted.

Suppuration.

Interruptions of circulation in the bones and perio
like similar interruptions in other parts, will lead to
either to the degree of suppuration, ulceration or gan
according to the character, completeness and suddenn
the obstruction. Suppuration may occur superficially, i
ing the lamellated osseous structure and the peritone
destruction, or deeply and within the cancellous portion
bone. In either of these situations the decompositio
be *acute* or *chronic,* being attended with the usual arde

flammatory resistance when acute, and rarely advancing to any great extent when chronic.

Acute Superficial Abscess.—Decay may begin either in the periosteum or the bone, both structures being ultimately involved. Inflammatory resistance is ardent, the pain and arterial excitement being at first confined to the bone and its covering, but the neighboring soft structures soon becoming engaged in the vital effort which presents all the manifestations of ostitis and periostitis. When pus is formed, distinct rigors are felt and deep swelling is perceptible, increasing with greater or less rapidity, following the course of the bone and soon becoming fluctuating. The periosteum is raised from the bone by the accumulating pus, but will not be ruptured or corroded for many days, or even weeks. When left to itself under these circumstances, the surface of the bone ulcerates more deeply, may become necrosed, and the whole shaft may be injured to a serious extent. The pus also degenerates and (being absorbed more or less) causes great debility of the system, provoking a feeble and irritable febrile resistance. When the pus is finally discharged, the sore will be found deep and foul, and will prove very difficult to manage.

TREATMENT.—Relaxing and cooling poultices, lobelia pills, relaxing teas and the other means that have been already advised for the relief of inflammation, are appropriate, for they loosen the tissues, limit congestion and lessen the extent of destruction. Large quantities of these agents will be required, the dense structure of the parts affected demanding more than an ordinary amount of remedial influence. When pus is present and an abscess formed, a free and direct incision must be at once made down to the periosteum. Delay favors caries and necrosis, as has been already mentioned. After the abscess has been emptied, it should be managed on the general principles directed for other abscesses. If caries or necrosis exist, they must be managed on the principles hereafter to be mentioned for the relief of these degrees of destruction.

Chronic Superficial Abscess.—Chronic abscesses on the surface of the bone are rare, always quite small and not accompanied by any considerable inflammation. Several of them may exist together, giving a feeling of so many small, soft and but slightly painful lumps, their fluctuation denoting the fluid character of their contents.

TREATMENT.—As in chronic abscesses in general, a systematic course of alteratives, tonics and vapor baths, must be employed, with the design of purifying the system and arousing the absorbents to take up the pus and the secernents cast it out. These abscesses seldom occur except in those suffering under a scrofulous or syphilitic taint, in either of which cases there will be much impurity to remove from the body, and the absorbents will take up so little pus at a time, that no injury will follow its passage through the system. The knife must not be introduced with too much haste; for an interference with the parts is apt to provoke active inflammation and considerable pain, and it is commonly the case that the tissues are so weak that they cannot sustain a successful inflammation, and then the afflux of blood will only increase the area of congestion and multiply the probabilities of more extensive destruction. Yet, when the abscess is large, it is best to empty it by a subcutaneous valvular incision.

Internal Abscess.—Abscess among the cancellated tissues may occur in any of the bones of the body, though the femur, tibia and maxillæ, are most frequently afflicted. The presence or abscence of a circumscribing plastic wall has led to the division of these abscesses into *diffused* and *limited* varieties. The importance of this division is not very material in a practical point of view, though the dangers and symptoms of each are sufficiently distinct to warrant us in considering them separately.

1st. The *diffused* or uncircumscribed form of abscess is most frequently met with. Destruction commences in or near the interior lamella, and extends through the vascular meshes of the part. But little fibrin is exuded, and the slight plastic wall that is formed gives way almost as soon as pus is formed, thus allowing the product of decay to be diffused through the cancellæ. This thin structure yields, ulcerating or sloughing speedily; the pus readily finds a way through the whole circumference of the bone and an entire shaft, from its inner canal to the periosteum, and from one end to the other, may be completely infiltrated with purulent material in a few days after the process of destruction commences. The pain suffered is excruciating; the constitutional disturbance is considerable; the whole bone is threatened with either necrosis or caries, and may be entirely destroyed; and pus may be absorbed into the general circulation, causing marked prostration, with rigors and hectic. When the pus reaches the periosteum (which may be in from six to twenty-four or more days) this membrane is raised up, leading to distinct swelling. Ultimately it will give way, the pus then burrowing through the soft structures and, sooner or later, finding its way to the surface. The ulcerated or gangrenous bones may then keep the orifice open, by discharges of pus, with all the usual evidences of caries or necrosis. Wherever any obstruction to the osseous circulation exists for a length of time and inflammatory action is established to resist it, internal suppuration is quite sure to supervene. In cases of diffused abscess, the existence of pus cannot be positively decided upon till external swelling and fluctuation denote its presence under the periosteum; yet the sudden accession of rigors, united with intense, deep-seated pain, will draw attention to the prospects of suppurative decay.

TREATMENT.—The abscess must be opened as soon as its existence can be satisfactorily determined by a free and direct incision. The system, if tense and laboring with fever of an inflammatory grade, should be properly relaxed by pills of lobelia, drinks of mint, ginger or boneset and enemas of ulmus and inflata. If the opening granulates properly, no dressings need be used, except such as are favorable to cleanliness, and some simple cerate to soothe the wound. If the patient becomes feeble, his strength must be supported by tonics, alteratives, mildly stimulating drinks (as of serpentaria, zinziber or polemonium), daily ablutions, quiet, good diet and regular motions of the alimentary canal. If the sore degenerates, poultices of ulmus, with hydrastis, zinziber, baptisia, cornus or capsicum, may be applied, the degree of stimulation being regulated according to the rules already considered for *Ulceration*. The opening itself may be syringed with the same articles. If caries of the bone continue, the local and constitutional management must be the same as will be directed in the appropriate section of this chapter.

2d. Limited *Internal Abscesses* are usually situated in the cancellated structure of the heads of the long bones, as the femur and tibia. The process of destruction is slow, and the space destroyed may not be larger than a small bean or a hickory nut, though sometimes a half pint or more pus may be found in these cavities. The decay usually begins around some minute center of obstruction, which is often a globule of mercury, though it may be a tubercle germ, or (as in limited abscess of the maxillæ) a piece of broken tooth. Persons beyond the middle years of life are the ones most frequently affected. The pain is excruciating, constant and *always confined to a specific and definite spot*. This last item is peculiar to this class of abscesses and is the only feature which is to be depended upon in diagnosis. The pain is not much increased by pressure, the skin is slightly reddened over the point, but there is no tension or swelling that would attract attention. Weight and throbbing in the center of the bone are complained of; the suffering increases at night (as is usual in affections of the bone) and the patient always affirms that difficulty lies in a spot upon which he can distinctly place his finger. There is a considerable degree of fever, which assumes the more typhoid grade as the system becomes enfeebled.

The inflammatory action around the abscess itself is of but a moderate degree. The bed of pus is surrounded by a distinct and thick pyogenic membrane, which becomes almost ossified in the course of time. The increase of purulent formation is, in consequence, very slow, and the cavity may exist for many years without the least apparent increase in size, especially when the circumscribed pus is not of that degenerate quality which constantly provokes inflammatory resistance. In those cases when it does increase in size, it is not so markedly at the expense of the surrounding structure; for the vital action makes one layer of bone quite as quickly as the chemical process destroys the other. The enlarging abscess is found to press the cancellæ of the bone together, making them more dense and compact. In some rare instances the circumference of the tibia has been almost doubled by chronic abscesses of this class; and dissection has shown that, while a large cavity existed in the center of the bone, the compressed cancellated structure was almost of its original thickness.

When there is an active and constant vital resistance to a limited abscess of bone, the amount of purulent material increases with more rapidity than in less importunate cases, and there is then a strong tendency to destruction of the plastic wall, when the abscess passes into the *diffused* class. Long confinement of the pus may also lead to its great degeneracy, especially in scrofulous constitutions and where the local vital resistance is considerable. We have known pus, discharged from these acute limited abscesses, to be of the most offensive odor and so putrid that barn yard fowls, who pecked into it as it lay cast upon the dunghill, died shortly after. Pieces of decayed bone are commonly found intermixed with the pus, under these circumstances. In acute cases, the constitutional disturbance is very great, the patient is likely to become delirious in consequence of the excitement, and hectic may set in either from sheer exhaustion, or from the systemic depression caused by some of the pus finding its way into the circulation.

TREATMENT.—In this, as in the former class of cases, the early use of the trephine is the only means upon which the practitioner can depend to shorten the process of suppuration, give the patient relief and save the risks of hectic, delirium and necrosis. An instrument of a middle size should be used and, the bone having been laid bare by an incision and dissection, the saw should be carried down quite to the middle portion of it, and *directly in the center of the spot to which the patient refers all his misery.* And even when this has been done by the trephine, a small chisel may have to be used before the pus will be found. When the abscess is in a maxillary bone, it may depend upon the state of the roots of the teeth, and extraction of one or two of them may prove the most direct mode of making an exit for the pus. The amount of the discharge, as before remarked, will be various, some of the most chronic and painful abscesses not discharging more than a drachm or two.

When an exit has been thus made for the purulent material, the after treatment is to be the same as in any other chronic abscess. The system will need to be invigorated by stimulating tonics, as hydrastis, aletris, cinchona and sabbatia. The body should be bathed and the flesh brush used freely, and the vapor bath may be needed frequently, the skin always demanding a great deal of attention. If the patient is of a scrofulous diathesis, stimulating alterants, as smilax, rumex, stillingia and arctium, should be used and every means taken to purify and invigorate the system. The opening itself is to be poulticed with demulcents, relaxants, stimulants or astringents, according to the character it assumes. If the strength has suffered, either by the depression of pain or purulent absorption, the tonics must be used as above and the procurement of fresh air, light, good food, etc., directed. If the patient is laboring under delirium or hectic when the practitioner is called, and the abscess has not been opened, it is useless to attempt to obtain relief without the employment of the trephine. As soon as the pus is let out, the pain, delirium and hectic, will cease and the patient be in a condition to be managed as above directed.

Tubercular Abscess.—Tubercular degeneracy and accumulations may occur in bones as well as in the softer structures, though the osseous system enjoys comparative immunity from this form of disease, even in persons of marked scrofulous diathesis. The articulating extremities of the long bones suffer most frequently, the femur seeming to be a favorite site. The bodies of the short bones are sometimes affected. The cancellated structure is the portion destroyed, a dull and continuous sense of weight being the only premonition of the mischief. Motion of the limb and pressure over the uneasy part provoke an actual pain, which the patient refers to the inner portion of the bone. Enlargement of the part is next noticed, and there is a bluish tinge and a slight edematous swelling of the superimposed soft parts. As yet, tubercle has not formed—the local circulation being congested, the earthy proportions of the osseous structure undergoing a waste, and nature preparing herself for resistance to the threatening destruction. Suddenly the uneasiness becomes a dull and constant pain, the patient shivers and has flashes of heat alternately, the part swells rapidly and a low grade of inflammation is established. Tubercular decay has now begun, the bones crumbling down into that peculiar soft, whitish-yellow, pultaceous material which characterizes scrofulous degeneracy. The inflammatory resistance is not strong. Effusion of molecules, and the formation of these into pus-cells, go on as in other abscesses; but the purulent accumulations soon become of a decidedly unhealthy character. In the great majority of cases, the corrosive quality of the pus is sufficient to break down the limiting wall at an early day, when the abscess is diffused, burrows onward among the cancellæ and often finds an opening into the joints themselves. But, oftentimes, the pyogenic membrane remains entire for many months, and a tubercular abscess of bone may exist a long time without finding its way into the articular cavities.

At first, there is little constitutional sympathy with the destruction, but ultimately there is a distinct general disturbance and vital effort at resistance. If the tubercular material should find its way into a joint, violent local inflammation will be provoked and there will be fever of an inflammatory grade, sooner or later passing into the typhoid grade, sometimes becoming hectic in consequence of the absorption of the pus, or perhaps because similar tubercular deposits, at other points, have caused constitutional exhaustion.

The purulent material may not find its way toward a joint, but may advance to the surface, where it will "point," as do other abscesses, and discharge spontaneously, if not previously opened by the surgeon. The opening thus made presents all the appearances of an ordinary scrofulous ulcer, similar degeneration of the bone existing at the bottom of the cavity.

TREATMENT.—Management is to be mostly hygienic. A good vegetable diet, fresh air, plenty of light, moderate exercise, cheerful company and daily bathing, are to be mainly depended upon. The clothing must also be attended to, the hours of sleep regulated and everything calculated to have an invigorating influence on the body insisted upon. In addition to this, alterants, as smilax, arctium, rumex, stillingia, alnus and taraxacum, are to be used freely. Vapor baths should be used frequently, the bowels unloaded by enemas when necessary and any secretion that inclines to fail should be restored by the medication appropriate to it. The sore itself may be poulticed with lobelia and zinziber in elm, the cavity being syringed daily with diluted hot drops, or other appropriate stimulants. If the sore should pass into the indolent form, a little capsicum or xanthoxylum may be added to the poultice and the stimulating injections used freely. If it should become irritable and painful, zinziber and capsicum may be omitted, and macrotrys, cypripedium, scutellaria or cornus, used with lobelia and elm. If any spiculæ of bone are found in the bottom of the cavity, they must be removed at once, and no direct attempts should be made to close up the orifice.

Tubercular deposits in bone are of very frequent occurrence. They do not always lead to distinct abscesses; for, as has been remarked, the wall of plastic material may break down so early as to allow a diffusion of the purulent material through the whole cancellated structure. These difficulties are important to the surgeon, for they many times lie at the foundation of caries and necrosis, often prove the starting point to fatal abscesses (as those of the lumbar and psoas regions), besides frequently destroying life by the rapidity of their own growth and the exhaustive drain they establish from the system. Erichsen (Surgery, p. 573) refers to a case in which he "amputated for acute tuberculous infiltration of the lower end of the femur, in less than a month from the first occurrence of the complaint, the patient, at the time of the operation, being nearly exhausted by hectic induced by the abundant discharge from the diseased bone and from immense abscesses in the thigh." It is more commonly the case, however, that the disintegration takes place slowly, only small quantities of tubercle being deposited. In whatever form, or under whatever circumstances these difficulties may exist, the strumous diathesis and the peculiar features of the scrofulous sore, will be unmistakably present.

Ulceration—Caries.

Hunter remarks, in his Lectures on the Principles of Surgery: "There is, I believe, no difference between the ulceration of soft parts and of bone," than which no expression can be more correct. Though less exposed to injuries than are the soft parts, and not decaying with as much rapidity nor upon such trifling occasions, the bones are yet subservient to the ordinary laws of decomposition and will pass over to the chemical power whenever their circulation is impeded. And osseous destruction can be also divided into distinct classes, according to the slowness or rapidity of the disintegratio the tendency to heal, and remain stationary or advance to still further decay. When only the surface of the bone is affected and there is a constant tendency to reparation, it is a *simple ulcer;* when it is more deeply seated, affecting the cancellated structure and either destroying rapidly, remaining an open sore or slowly continuing its disintegration of structure, it is termed *caries.* Under the latter term are included what might more properly be classed as indolent, inflammatory and phagedenic ulcers. We object to the term caries as not being accurate, but shall use it because it has become a fixed technicality with the profession.

Simple ulceration rarely destroys more than the outer layer of bone, though it occasionally degenerates and burrows into the cancellated structure. It may be a sequence of venereal poison, tubercular degeneracy or violence; most commonly it proceeds from the contact of purulent destruction of the periosteum or the soft parts above the periosteum. From whatever cause it may proceed, it is accompanied by inflammation, effusion and intense, circumscribed pain, evincing distinct ostitis. The pus will find its way to the surface sooner or later, discharging readily, being usually bland and not large in quantity—unless it has been an abscess of the soft parts. The bone disintegrates slowly, the surface becoming spongy and irregularly excavated, both of which conditions can be readily detected by the probe. The center of destruction is the deepest, the ulcerated surface beveling pretty regularly from that point to the edges.

This sore disposes to heal in nearly all cases, granules being thrown out and formed into bone. The process is a slow one, the amount of fibrinous exudation being much less than in soft structures. The ulcer may degenerate into one of the *weak* class, when the reparative process will almost, or entirely, cease, the sore remaining open for several months together. It is very seldom that it will pass into the *indolent* form, but it occasionally does so, when it becomes a very intractable difficulty.

TREATMENT.—The principles already laid down for the management of other simple ulcers, will apply here. Plain water dressings are generally sufficient, the sinus from the external surface to the bone being also regularly and carefully syringed with tepid water. Attention must be given to the diet, state of the secretions, rest, etc. If the sore should degenerate, the soft parts presenting the appearances of either a weak or indolent ulcer, small quantities of stimulants must be put into the poultices and washes; such drinks as asarum and zinziber employed; vapor baths given occasionally and tepid sponging daily; the bowels must be unloaded with leptandra and a little capsicum; an emetic administered if the stomach is foul; and alteratives used freely if the patient is of a strumous inclination or shows an impure condition of the system. From the small granulating power of bony parts, the process of reparation is always slow; and it is no uncommon thing to have the most favorable ulcers take several months to become fully repaired.

Caries.—This degree of ulceration is most common to the vertebræ, astragulus, tarsal and carpal bones and others of a large proportion of cancellated structure. The destruction may be slow or very rapid and is always accompanied by inflammatory action, the grade of which usually corresponds with the acuteness or tardiness of the ulceration. The inflammation and pain are the first evidences that mischief is being done in the part, their accession being sometimes sudden and at other times slow. The constitution sympathizes with the difficulty from the first, the pulse rising, the skin flushing and the head aching with fever of an inflammatory grade. These symptoms may continue without abatement for several days, the pain suffering temporary remissions and the part slowly swelling and becoming harder. Sooner or later, some portion of the integuments will become purple from congestion, then open and discharge a thin and rather fetid pus. Decay has now commenced, and the probe will sink into the bone readily, though a firm and sound crust may at first prevent the instrument from reaching the seat of the ulceration. The bone is soft, the vascular and organized portions having passed into a state of liquefaction, with the earthy portions floating through it in small grains. It resembles a worm-eaten piece of wood and the destruction may concern only a small portion of the tissue, or it may extend several inches—sometimes wasting the whole length and breadth of a small bone, advancing to the articular cavities and even moving onward through a whole chain of bones. It is only under peculiarly favorable circumstances that a reparative attempt of any value is made in the parts, ulceration advancing slowly and chronic inflammation being established around. The discharge is constant, not profuse, usually thin, fetid, slightly bloody, acrid and mixed with larger or smaller proportions of the disintegrated earthy materials. The sore may remain in this condition for months or years, the surface presenting a large and pretty firm swelling, ha ing one or several apertures and presenting, at times appearance of an indolent ulcer, or that of the weak, sc lous, irritable or cachectic, ulcer, according to the constit of the patient, the purity of the blood and the nature of the provoking cause. The appearance of the soft parts is generally indicative of the condition of the bone—the bone, however, being usually in the more degenerate state.

A layer of fibrin in the bone is built up around the spongy and decaying parts, though this wall will gradually give way to the advancing destruction. The edges of the caries are usually abrupt, but are occasionally beveled from the center to the edges. Sometimes a large portion of the lamellated structure will mortify, peeling off in a mass and constituting a sequestrum, as in necrosis. This is not common except when the caries has existed for a long time.

The constitutional impairment attending caries is always marked. There is generally a strumous habit and impurity of the system at the foundation of the destruction. The acute suffering fatigues the patient, usually leaving him exhausted, irritable and with a poor appetite. The continuousness of the discharge still further exhausts the strength and the feebleness (together with the suffering and loss of rest, exercise and fresh air which so invariably follow for months) contributes to foster an irritableness which is very unfavorable to reparation. Indeed, the health usually sinks so low for a time, that it is not uncommon to have a typhoid condition added to a most unmanageable form of irritative fever. All the care of the practitioner will be needed to secure the patient against such contingencies, as their accession will favor the advance of the caries, may make a necessity for amputation and will cause death when the bone affected is near the trunk or along the track of the nervous centers.

The *causes* of caries are multitudinous, though they may be conveniently arranged under a few heads. The first head may be made to embrace all those cases where the destruction of bone has followed destruction of some of the adjacent soft parts, as, from abscesses of the periosteum, muscles, etc. These cases are analogous to those of *simple* ulceration; but when that grade of destruction advances through the lamellæ of the bone .and reaches its cancellated structure, wasting away its organized portions and causing the earthy materials to crumble, it constitutes true caries. The advance is from the soft parts to the bone, not from the bone to the soft parts, as is most generally the case. When the difficulty commences in the latter way, there is seldom more than one fistulous opening upon the surface, the formation and discharge of pus are more early than when the destruction begins in the bone itself and the parts are much more tractable to medication.

In the next class of causes may be mentioned those of a mechanical character, as from the lodgment of shot or ball, spiculæ from comminuted fracture, etc. These cases are usually of a degenerate character, the pus becoming foul, the reparative action being (usually) quite ardent but inefficient, and the bone not only crumbling away, but tending to turn black and pass into mortification (necrosis).

Another cause is the infection of syphilis, the poison permeating the whole system and lodging in the bones, especially those of the cranium. The venereal virus seldom causes this destruction except when it passes into tertiary syphilis, though the secondary syphilis is occasionally degenerate enough to lead to extensive caries. Added to this we frequently find mercurial taint, the quantities of this mineral which are so commonly given in the treatment of syphilis, overcoming the vital power and lodging in the bones, there causing frightful and intractable ulcers. Mercurial caries are the most common, as well as among the most violent, with which the practitioner meets; and if the mineral caused no other mischief than this, it should be enough to forever banish it from the materia medica and bring upon it the odium of every intelligent physician. But when we wed mercury with syphilis, the case becomes doubly violent, leading to the most frightful and loathsome forms of osseous destruction that ever come to the knowledge of the surgeon.

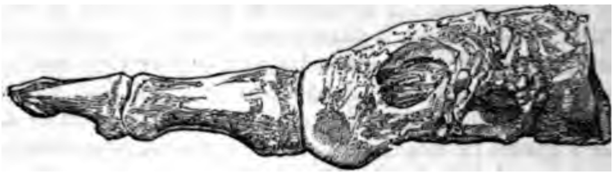
Mercurio-syphilitic caries are generally of the chronic class, advancing slowly, suffering from unabated pain, provoking but slight inflammatory action, burrowing extensively through the bone and generally opening upon the surface by a number of fistulæ. The sores in the soft parts usually present all the peculiar appearances which distinguish the ordinary cachectic ulcer, being, if possible, still more degenerated. The discharge is watery, remarkably acrid and loaded with the loathsome fetor of venereal. The fistulæ increase in number as the caries advance, usually enlarge persistently and run into one another, and it is no uncommon thing to have all the soft parts rot away completely, laying bare the carious bone for a considerable distance. Sequestræ from necrosis are more common here than in any other form, and this, of all the grades of osseous ulceration, may be classed as the phagedenic sore.

There is also a tubercular form of caries which affects those of a strumous habit. This is found oftenest in young persons and makes the bones of the foot and vertebræ a favorite position for its ravages. It begins, advances and terminates, in all respects like the tubercular abscesses of bones, as discussed in a previous section, the chief difference being one of extent.

The openings in the soft parts present all the appearance of the scrofulous ulcer, and the bone itself becomes remarkably spongy, presenting a creamy appearances and breaking down under the least touch.

The danger from caries is at all times considerable, often making a necessity for amputation. When some insignificant part, as a phalanx or metatarsus, is the seat of the decay, amputation is not of vital importance. Even legs and forearms may need to be removed, and yet life be not endangered. But when the hip joint is affected, or the ribs or occiput become the seat of the difficulty, and especially when any portion of the vertebral column is thus ulcerated, the case assumes an aspect of the greatest gravity, the patient becoming rapidly emaciated and hectic, and the large blood vessels, nerves and other contiguous vital organs, being iminently endangered by the advancing decay.

FIG. 50.



Caries of the Metatarsus of the Great Toe.

TREATMENT.—It will be seen by reference to the first class of influences that may cause caries, that the treatment can not be commenced at too early a day. The moment there is the peculiar heavy pain and low inflammation which denote threatening mischief to the bones, the patient must be put upon a rigid system of hygiene, alteratives and baths, that every impurity may be speedily removed from the system and the decay thus limited, even if it can not be entirely prevented. And when an abscess forms in the soft parts, under the periosteum or in the bone itself, the purulent material must be let out at the earliest possible moment. Even if pus should not have formed, the most active management must be at once instituted, as has been already directed in acute abscess and ostitis. Whenever, therefore, a violent pain, over or around a bony structure, is accompanied by an inflammatory action and a tendency to constitutional sympathy, lobelia poultices must be applied constantly and almost without limit, the skin bathed thoroughly and the bowels unloaded by enemas, emetics being given if the stomach is foul, and lobelia used internally and in large quantities when the pulse is full and hard If the difficulty begins with a dull pain, low grade of inflammation, shivering of the body followed by a brown tongue, irritability and sense of exhaustion, the poultices should contain a little capsicum, emetics of a stimulating character should be given at once and the stimulating vapor bath employed daily. This treatment, graded in the degree of its stimulation, should be earnestly pressed till the accumulation of pus denotes the necessity of puncture, when an appropriate incision should be made and the material discharged. This course may wholly avert some cases, and so effectually limit others as to render comparatively trifling that which would otherwise have proven extensive and baffling.

If the case resolves itself into one of simple ulceration, it must be managed as has been already directed. Many cases of simple ulceration run into unmanageable caries, merely because their apparently trifling character has been permitted to throw the practitioner off his guard. Such an indiscretion must be carefully provided against, by fixing the mind distinctly upon the fact, that the smallest difficulty may come, by neglect, to be the largest and most serious. The management of simple ulceration of bone is a comparatively easy matter and he who allows it to degenerate into caries by his own neglect, can not be called a skillful surgeon.

When it is made evident, by the character of the discharge and the feeling presented to the probe, that cancellary destruction has actually commenced, the removal of the dead portions should be effected as early as possible. Two ways are pursued in effecting this: one by the knife, gouge and forceps—the other by medication. The latter method is always to be preferred, and instruments should, at no time, be resorted to till medication has failed, which is a rare occurrence.

We have already remarked that caries soon passes into the form of the ordinary indolent ulcer, which has heretofore been described as it occurs in the soft parts. The vascular excitement abates, sensitiveness is diminished and the soft parts become indurated and of a bluish-white color. Destruction of bone, and its peculiar thin discharge, continue without abatement, advancing slowly, but surely, from point to point, scarcely meeting any vital resistance. As in the ordinary indolent ulcer, stimulation is now called for. Begin the treatment with a thorough emetic, using such articles as zinziber, capsicum and myrica, in the teas. Follow this with a mild vapor bath, and then apply a stimulating poultice to the parts. Capsicum and lobelia in equal quantities, mixed with ulmus, form a good poultice. Strong inflammation will be soon arous by this means, and the pain may become intense; but the surgeon should persevere till a scarlet hue is obtained and a pretty free purulent discharge set up. This may require one, two, or three hours, though we have sometimes kept on a poultice of the above character for twelve and eighteen hours before we obtained the desired grade of vital action. This action will be established sooner or later and a fibrinous exudation set up behind the carious part. This is slowly formed into a wall of lymph, cutting off communication between the caries and the sound portions and thus protecting the latter from the destructive influence of the purulent material. It may require some days to accomplish this; but after the first poultices have aroused thorough vital action, those of a relaxant and gently stimulant character may be continued and the constitution attended to in the manner to be hereafter mentioned. When the protective wall has been completed, the carious bone will decay and be cast off, coming away in the form of small spiculæ or sequestræ, as in necrosis.

Removal by instruments should be attempted only after the above medical management has failed. The soft parts should first be allowed to become quiet and relaxing poultices may be employed to soothe and relieve them. Having ascertained the extent of the destruction by the careful introduction of a probe, an incision should be made either V or T shaped, according to the position of the parts. Having thus laid the bone bare, it is then to be removed by those instruments which seem best fitted to the condition of things. The saw is appropriate when a bone is to be cut through; the bone-pliers of Liston will be best when the difficulty is mainly superficial; the trephine may be employed to advantage when the affected surface is small and gives no evidence of extending beyond the center; the gouge is used in some cases, but is a rather clumsy instrument and should not be selected when any other tool can be handled to advantage. Rules for the peculiar conditions in which each instrument should be always used cannot be given; for it is not uncommon to find cases in which two, or even three, of them will be needed, in order to accomplish the work well. One thing must be always done, namely, use the tools with determination and cease not till every trace of caries has been removed.

Many surgeons are in the habit of employing escharotics to lead to the ejection of carious bones, either inserting the actual cautery or injecting solutions of nitrate of silver, potassa fusa or vegetable caustics. This course is attended by only the most meager success, having but few good results to testify to its value. Its appropriateness, too, can be most decidedly called into question, for the escharotics cannot be applied to an extent sufficient to destroy the bone without at the same time causing unwarrantable disintegration of the soft parts. And when they have done all that can be rationally expected of them, they have accomplished good only by *provoking* to an inflammatory action in the parts, the inflammation then casting off the affected bone in the same manner that it does any other diseased or decayed portion of the system. This is but an *imitation* of the effects wrought by the stimulating poultices, these being always direct abettors of the vital effort, the escharotics as universally tending to the injury of the living as well as the dead. Every consideration, therefore, gives the mode of stimulation the preference over all others, and escharotics of every grade may be entirely discarded and the surgeon not be at all crippled in his curative resources.

When the carious portions of bone have been removed by any of the above processes, the case is simply one of ulcer of the soft parts and is to be treated accordingly. An intense inflammatory action may continue, which, though not to be dreaded in any way, should be calmed by water dressings or demulcent poultices. If instruments have been used, there is usually some danger of congestion and suppuration in the parts that have been incised, and this must be guarded against by the employment of poultices which contain small quantities of zinziber, or asarum, with elm and lobelia. If the previous feebleness of the parts now favors a tendency to gangrene, myrrh, capsicum, or xanthoxylum, is to be used as a stimulant. If the tissues assume a healthy condition and the sore inclines to good granulation, the treatment is to be of a plain character, a few days then usually sufficing to close up most of these openings. If the case has been caries of the frontal bone, or any other bone about the face, it is necessary to bring the edges of the sore together as evenly as possible and use the animal oils freely, that the scar may not be too contracted, but appear as seemly as possible.

While this treatment is being directed to the sore itself, the most energetic constitutional management must also be employed from the accession of the ulceration till after it is completely cured. It has been already seen that systemic medication was necessary in the weak, and especially the indolent, ulcers of the soft parts; and the reasons which show its importance there are ten-fold more weighty in proving its requisition here. The practitioner should look upon it as his main reliance in the question of *cure*, however important the local management may be in the separation of the carious portions. Hygiene should be also constantly kept in view, every opportunity being seized upon to favor digestion, secretion, excretion and every other function. No circumstance that is calculated to interfere with any of the functional duties, should be allowed to continue for a moment, every labor required for their removal being amply repaid by the good results that will be obtained. The food should be mainly vegetable, and that whether the case is from a syphilitic taint, a mercurial poisoning or a strumous diathesis. Meats are not to be rejected *in toto*, but their moderate use is advisable, and the more oily kinds should be wholly abstained from. Exercise and fresh air are next in point of value, and a regular system of bathing and friction should be carried out. The vapor bath, employed frequently, is of great value, though we have found it peculiar that most patients afflicted with caries object to its use, preferring simple ablution.

Alterants should be used freely, those of a stimulating character being preferable, as smilax, stillingia, rumex and guaiacum. They should be made into sirup and drank in considerable quantities and regularly. The stomach frequently fails, when moderately stimulating emetics will be needed. Emetics should be used occasionally whenever the appetite becomes precarious, the head aches and the tongue is coated, even if that coating should be found to disappear after the first hours of the morning: hydrastis, columbo, sabbatia, aletris and similar stimulating tonics, should be used whenever digestion fails, their action being seconded by exercise, fresh air and sunlight.

We have already alluded to the fact that the patient is apt to sink into that condition which is evinced by the *Irritative Grade of Fever*, sometimes becoming decidedly typhoid and again falling into the hectic of exhaustion. Whenever any of these conditions occur, the most prompt measures must be taken for their removal, else the constitutional failure may progress till life is jeoparded, and this even within a few days. If the febrile resistance is of the irritative cast, drinks of balm, sage, asarum and mint, should be used; an emetic being given with drinks of such articles as these. Quiet should be provided, a moderately hard bed directed, good ventilation secured to the sick room, and the bowels kept fairly open by enemas of elm and lobelia. If the depression assumes the typhoid form, one, two, or many emetics, should be given—zinziber, asarum and myrica being combined for a drink. Enemas of lobelia and a little ginger should be given when the costiveness is considerable—of lobelia alone when there is any tenderness, and of geranium or myrica if any diarrhea sets in. If paroxysmal febrile effort marks a hectic, drinks of salvia, mentha or asarum, should be given when the fever is on, and hydrastis, populus and other tonics, during the remissions. For further minutiæ in the treatment under these several circumstances, the student is referred to the chapter on *Fever*.

Among the constitutional means used in cases of mercurial origin, none can at all compare with the application of the Electro-Chemical Battery, as introduced by MM. Poly and Vergnes, of Havanna, and Prof. J. M. Sanders, of Cincinnati. As a majority of all carious bones are traceable to mercurial impregnation, the deposition, or elimination, of that mineral from the system is the great end to be accomplished. Baths, alteratives, emetics and all other means which freely open the excretory organs, are very potent in bringing about this result; but the electro-chemical bath is, when used in connection with these means, equal to the eradication of mineral causes heretofore counted incapable of removal. The bath consists of a series of the common "Gove's Battery," from ten to twelve cups being sufficient. A wire is passed from the positive end of the battery to the patient, who sits with his feet upon a plate of copper in a tub of water, salt or vinegar having been placed in the water. Another wire connects the copper plate with the negative end of the battery. When the chain is connected, the action of the electro-chemical current carries the particles of mercury to the copper plate, according to the well known laws of chemical deposition, sometimes depositing them there in such quantities that the oxide of mercury can be clearly seen, at other times eliminating only small quantities. The current through the system may be continued one or two hours, or half an hour may be found sufficient in feeble persons. It may be repeated every day, every second, third or fourth day, and its use persevered in for such lengths of time as each case may seem to require. In long standing cases, relief may not be felt till the bath has been used two or three times, and a dozen or more applications may be needed to give full satisfaction; in milder and more recent cases, three or four baths may be found sufficient to eliminate as much of the offending mineral as can be removed.

This application of electro-chemistry is of recent introduction, yet much good has been already effected by it. Still, the practitioner should not be carried away by the idea that it is a panacea.

In Morbus Coxarius and Pott's Curvature of the Spine, the treatment is almost altogether constitutional—the parts afflicted being so remote from the surface, that topical applications can exert but a moderate degree of curative influence upon them. The proper mode of managing these affections, will be considered in detail in the proper places.

Necrosis.

Necrosis of bone is, in all respects, analogous to mortification of the soft parts, the structures losing all vitality and being cast off in the form of earthy sloughs known as *sequestræ.* The lamellated portions of bone are the ones peculiarly liable to destruction, and the decay may be limited to a small layer of the surface, or extend through the greater part of a shaft and even involve several contiguous bones.

CAUSES.—Direct and severe external injuries may cause almost immediate necrosis, as, when a burn crisps all the textures into an eschar. Blows upon those bones which lie near the skin, wounds that penetrate to the osseous structures, and deep frost bites, are also fruitful causes of this decay. Some of these causes, as excessive cold and heat, cannot be said to injure the bones themselves, yet they will be speedily and surely followed by necrosis if they extend their influence to the periosteum. The use of the mercurials has long been known as a prolific cause of necrosis, producing frightful destruction among the bones and laying the foundation of cases that are most intractable to medication. Even when the mercurials do not cause direct destruction, they impair the vital integrity of the osseous structures, as well as weaken the constitution, and thus place the frame in a condition favorable to the development of necrosis upon occasions that would otherwise have proven insufficient to injure the body. The absorbed fumes of phosphorus, as in the manufacture of lucifer matches, cause serious mischief to the osseous structures, more particularly affecting the jaws. Before the improved methods of using phosphorus were found out, this branch of occupation used to cause frightful havoc among the teeth and maxillæ of the operators; but since it has been discovered that the application of a high heat will render phosphorus comparatively harmless by changing its chemical relations to oxygen and lessening its proclivity to form phosphorous acid fumes, the mischief from this business has been greatly lessened. The arsenical fumes arising from copper smelting, have also been known to lead to the same death of the earthy structures. In the necrosis proceeding from these last two causes, the fetor of decomposition is almost insufferable and the bones crumble away like sand rather than slough off in the form of sequestræ.

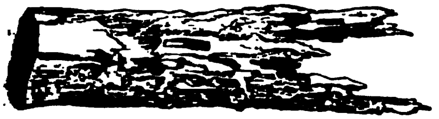
But a great many cases of necrosis arise without any known local cause, and can only be traced to a scrofulous diathesis. These occur most frequently in children, and some slight jar, blow or twist in play, may have proven an exciting cause to the malady; but it is seldom that even such trifling accidents can be supposed to have had anything to do with the necrosis, which must be attributed wholly to scrofulous depositions or degenerations of the osseous structures. Cases of this kind are numerous, perhaps more numerous than those of any other origin. In large cities, syphilitic impregnation of the system frequently causes necrosis—the flat cranial bones, the tibia and the posterior border of the ulna, being the parts most frequently affected by this poison. The syphilitic virus chiefly affects the surfaces of the bones, often spreading over a considerable space without advancing to more than a superficial depth. These cases are always associated with a marked venereal taint of the system.

On some occasions, the causes which make a necessity for ordinary febrile developments will prove sufficient to lead to necrosis. Of this class may be mentioned the osseous mortification that follows rheumatism. The difficulty here arises in the periosteum, the bone suffering in consequence of the injury done to its investing membrane, which, it is presumable, is then separated from the parts underneath with so much violence, that damage is done to the nutrient circulation of the bone. The trochanter major is the most frequent seat of necrosis having this origin, and the structures of the whole hip joint are generally involved to such an extent that these cases are apt to prove very tedious and exhausting. We have already seen (in the division upon *Caries*), that the simpler forms of osseous ulceration may degenerate into necrosis, when, although not really producing the mortification, they are allowed to stand in the relation of causes to it, seeing that they go before it. Necrosis of the trochanters and tuber ischii has been known to result from ordinary pressure upon these points; but such cases are extremely rare and are only met with in persons of enfeebled constitutions, or those who are much confined to bed. Mr. Stanley well observes (p. 76): "There are instances of necrosis, affecting a portion or the entire shaft of a bone, not traceable to any distinct cause. * * A large portion of the lower jaw, in young persons, occasionally perishes without any previous derangement of health, local injury or other apparent cause. But in some cases, an aching in the bone has preceded the death of it. Such examples of necrosis usually occur in early life. * * In the same order of cases are the instances of necrosis attacking two bones simultaneously in the same limb, or in distant parts of the body." We have met with several instances like these, in some of which the destruction seemed referable to a scrofulous taint, and in one of them we suspected a mercurial influence, though in this we may have been mistaken.

History of its Progress—Symptoms.—An inflammatory resistance is established in almost every case of necrosis—the intensity of the action and the peculiarities of the pain and swelling accompanying it depending upon the nature of the cause, the seat of the decay and the constitution of the patient. When the outer lamellæ are affected, the pain is acute and throbbing, the soft parts swell and present a florid appearance, the periosteum separates from the dead bone, there is an accumulation of pus, ulceration of the super-adjacent soft parts, and, ultimately, one or more fistulous openings from the bone to the surface. When the inner lamellæ are mainly concerned, the system establishes a febrile resistance, which may continue several days, or as many weeks, and then subside and be followed by deep-seated pain. Decay of the adjacent cancellated portions follows destruction of the lamellæ; the pus finds its way outward through narrow fistulæ in the bony walls; the soft parts become inflamed as the decomposition of the bone advances; and abscesses of various sizes form under the skin and burst externally, discharging a fetid, ichorous and partly sanious fluid. The fistulæ in the walls of the bone can then be detected by a careful examination with the probe.

As the bone dies and passes under the dominion of the chemical power, it is separated from the living portions, partly by its own softening, partly by the granules which will be thrown out upon the surface of those structures which retain their vitality. This separation takes place very slowly, weeks, and even months, being required for its completion. Sometimes a small portion of the decayed tissues will be separated at a time and the process advance by piece-meal, from point to point. At other times, the whole mass will be at once detached from the living parts, being lifted up and borne outward by successive layers of granules formed upon the sound side. When the inner lamellæ of a shaft are the parts affected. the dead portions cannot be readily removed by the vital power. The chemical process of ulceration must first break down the cancellated structure and advance through the outer lamellæ, when the destroyed portions will pass into more complete decomposition and find their way out through the fistulous openings, in the form of earthy granules mixed with fetid pus. When the outer lamellæ are the parts destroyed, the dead portions are more frequently separated in pieces of con-

Fig. 51.



Sequestrum of the Femur, the whole thickness of the shaft having decayed.

siderable size which may be readily removed by the surgeon or will be more slowly cast out by the unaided efforts of the vital force. These pieces usually occur in flat, irregular and porous scales, of very variable sizes, being sometimesw hite, again mottled with brown spots upon their under surface, and occasionally brown all over. Necrosis of the outer lamellæ seldom occupies a large portion of the surface, can be detected by the loose feeling of the sequestræ under the probe and recovers more readily than when the destruction is more internal. When the inner lamellæ mortify, the destruction may involve almost the whole length of the shaft, the sequestræ separate like a continuous tube within a tube and the process of separation and ejection may occupy from three months to two years.

When the entire shaft of a bone is about to mortify, acute pain in the limb is the first symptom, the soft parts have a most intense inflammation established in them and general arterial excitement follows. In these cases, the periosteum separates from the bone at an early day; the pain is of the most agonizing degree, exciting the patient and often leading to actual delirium; and the surface of the limb presents the appearance of a mild phlegmonous erysipelas. Extensive effusions of serum take place and these, in the healthy, may be formed into fibrin, giving hardness and firmness to the limb; or they may simply puff up the soft integuments of the feeble or decompose and form one large, or several small, abscesses in the unhealthy. If the effusion takes place under the periosteum, the pain is severe and uninterrupted—of which cases whitlow is a familiar instance. When these abscesses form, they require to be opened at an early day, else they will not only weary the patient by continued suffering, but may burrow among the muscles and cause exhausting destruction of the soft parts, which will be followed by the low recuperative effort of hectic after the evacuation of the pus. Several fistulous openings are made by the liquid of decomposition, and the acrid fluid is discharged through them freely. The periosteum generally commences the formation of a new bone as soon as the disturbance caused by the decay of the old one has fairly subsided. The process of organization is carried on with varying degrees of rapidity, according to the purity of the blood and the vigor of the patient's constitution; but a new shell of bone will be ultimately formed upon the inner side of the periosteum, encasing the old bone before it has had time to soften and be cast out. These cases thus become analogous to those in which the whole inner lamella of a shaft decays while the outer lamella remains alive.

When the articular ends of a bone are affected by necrosis, the influence of destruction is seldom confined to the head first diseased, but usually extends to the adjacent bones. This is particularly the case among the small bones, and it is no uncommon thing to find the whole carpus or tarsus, and also the metacarpus and metatarsus, or even a continuous row of bones from the wrist or ankle joint to the last phalanx, decay in succession. But this advance of necrosis from bone to bone is by no means confined to the smaller portions of the skeleton; for, as Mr. Stanley observes (op. cit., p. 84): "Disease in the knee joint has ensued from necrosis in either the femur or the tibia, near its articular end; and I have known instances of disease in the hip joint, the consequence of necrosis in the trochanter major of the femur." Cases of this kind are of frequent occurrence. We have ourselves met with a number of them.

Just at this point we would continue our quotation from the valuable work of Mr. Stanley, to whom the surgical profession is indebted for so much that is useful in relation to the affections of the bones. He goes on to say: "Destruction of a joint has ensued from necrosis in its neighborhood, merely by the abscess, which formed in the soft parts around the dead bone, bursting into the joint. Destruction of the joint then quickly followed, with the severe constitutional disorder [say, rather, ardent febrile resistance] which always follows the bursting of abscesses into large joints. It is true, that disease in a joint, which has been the consequence of necrosis in its neighborhood, is often with difficulty distinguishable from the acute affections of joints arising in other ways; yet attention should be alive to the occurrence of such cases. More than I have been present at the examination of an amputated joint, when there was occasion for regret that, before the operation, it had not been ascertained that a small piece of dead bone lay loose, but imprisoned, within the living bone, near to the joint, whence it might have been easily removed."

We have seen that active inflammation is established at the outset of all cases of necrosis. This is a natural consequence of the threatening decomposition; for it must be expected that the life power will make a decided resistance to the advance of chemical power and use every means it can command in an endeavor to limit the disorganization. The great denseness of the structures in which this inflammation is set up, causes the most acute suffering to the patient, and the sympathetic nerves convey the excitement through the whole system, stirring up an active febrile exertion. These vital manifestations continue ardently as long as the destruction of the living bone is going on. When the spread of the necrosis has been checked and the living parts have thrown off the dead, the arterial excitement gradually subsides. It has been already remarked, that several fistulous openings usually give passage to the pus. The discharge from these is at first profuse, always fetid and generally ichorous. The infiltration of serum through the soft parts (consequent upon the inflammation) is formed into a dense structure, molding the fistulæ into thick-walled tubes and giving their outer edges a pouting appearance. As the dead bone becomes entirely loosened from the living, the discharge gradually diminishes in quantity, and ultimately dwindles down to a little watery oozing noticeable upon each change of the dressings. The sequestræ are cast out at various times, but the process of their complete separation is a very slow one and several months may elapse before the least particle of dead bone is ejected. The inflammatory excitement seldom continues at an intense point for more than three or four weeks, and we usually find the vital action at a moderate standard and the fistulæ in a partially indolent condition, for some weeks before any pieces of bone appear. One piece is usually cast out at a time, and months, even years, may be required for the removal of the whole—sequestrum after sequestrum coming away at irregular intervals, the fistulæ remaining open and the dense swelling remaining in the limb. It is not often, however, that a case of necrosis will remain unhealed (even without professional assistance) for more than eighteen months, while it is equally rare to have one recover in less than six months. In cases of hip disease or white swelling, the difficulty may continue for ten or twenty years, alternately improving and degenerating, till death gives relief to the patient's sufferings. But inflammatory (vital) resistance never wholly subsides in the affected part so long as any portion of the decayed bone remains. The constitutional disturbance is very liable to sink into hectic manifestations during the continuance of the profuse discharge; after which the general health may be good and the sores present a somewhat healthy and uninflamed appearance. But some more pieces of the necrosed bone may now become loosened, when the enfeebled nerves will be agitated to keen suffering and the weakened frame rally to an effort which can be scarcely raised above the typhoid grade. The fresh sequestrum having been removed, the vital excitement subsides, to be again aroused upon the separation of other sequestræ.

Reparative Process.—The process by which destroyed bone is replaced does not differ, in its essential features, from the same process in other structures, although different circumstances cause slight modifications in the progress of the reparation. The dead portions are first loosened from the living by the line of separation (see *Mortification*, Part II) and a layer of granules is thrown out upon the living surface. As the dead bone liquefies and crumbles under the influence of the chemical laws, these granules fill up the space left by the disintegration. The healing process advances from both the living bone and the periosteum, when only the external laminæ have been destroyed; and from the bone alone when the internal laminæ, or the entire shaft with its periosteum, has been lost by the necrosis. An opening through the outer lamellated structure and periosteum is always formed by the suppurative process, but the advance of this perforation is sometimes very tedious and prolonged. The sequestrum, remaining embedded and acting as a foreign solid within the osseous covering, provokes a moderate inflammatory action, which is accompanied by a continuous and prostrating pain. The advancement of granulation is also retarded and the granules themselves may be so enfeebled by the persistent pressure of the bony slough and the deteriorating influence of the retained ichor, as to be successively broken down and destroyed. Under such circumstances, the reparative process can not be said to advance; but when the chemical influences have made a perforation through the bone, periosteum and soft parts, granulation advances steadily, though slowly, till reparation is completed. Sometimes the sequestrum will be grasped, at some point, by the rapidly exuded granules. When this occurs, a longer period of time will be required for the reproduction of all the destroyed parts.

Generally, all portions of structure lost by necrosis are ultimately reproduced. This is especially true when only the lamellæ have been destroyed; but almost the entire shaft of long bones may be replaced in the course of time, and young and hearty persons most commonly regain all the original osseous structure. The short bones, however, are never reproduced when completely necrosed, and the same is often true of the flat bones (as of the cranium) when destroyed through their whole thickness at any part. Reparation is also uncertain when the periosteum has been removed to any great extent, whether by the corrosion of ichor or by mechanical violence; for the periosteum is at all times largely concerned in osseous reproduction, and its own loss is seldom made up (except in a small degree) by the vital power.

TREATMENT.—Necrosis can not be positively said to exist till after destruction has advanced far enough to form sequestræ and cloacæ. It may be suspected, but nothing less than examination by the probe will decide the suspicion. On this account, destruction might advance over a large surface before medication could be brought to bear upon it, were it not for the fact that all necroses commence with symptoms of ardent ostitis, and that medication which will relieve the latter will be sure to act as a preventive to the former. It has been seen that the circumstances and influences which will provoke an inflammatory resistance in the bone and periosteum, will also lead to caries, necrosis and other forms of chemical destruction, unless removed. Acting as impediments to the circulation, these causes cut off nutrition to a greater or less extent, and destruction of the parts (proportionate to the degree of obstruction) must necessarily follow. If these impediments can be overcome and removed, no vital action will be provoked and no destruction can ensue. The same means and processes that will remove them once will remove them always; hence the existence of ardent inflammatory action in a bone is always to be met by the most thorough and energetic treatment that can possibly be brought to bear upon the parts and upon the constitution. The dense formation of these tissues renders them comparatively unimpressible to medication, and it is only by the most vigorous management that they can be so far relaxed as to allow the removal of the impediments and maintain full nutrition.

Whether, therefore, the practitioner does or does not suspect the existence of necrosis, the establishment of inflammation in the periosteum, or bone, is a positive evidence that some form of destruction is threatened. Without waiting for the development of the decomposing process, he should anticipate and limit it by commencing, at the earliest hour, with the treatment that has been already directed for *Periostitis*. This treatment must be applied with great thoroughness, as there is scarcely a possibility of doing too much for the part, but great mischief may be the consequence of doing too little.

When cloacæ have formed and it becomes evident that the case is one of necrosis, the surgeon must wait patiently till nature has separated the sequestrum. This may take several days or as many weeks, but there must not be any instrumental interference made while this process is going on. To attempt removal of the sequestrum now, is to submit the patient to [illegible] and the granules [illegible] that it will take wee[illegible] destroyed in a f[illegible] the force used in det[illegible] where the head of [illegible] be driven into an ar[illegible] of the joint and with a [illegible] Continue the more moderate use [illegible] means that were employe[illegible] excitement; preserve cl[illegible] perfect quiet of the limb or [illegible] diet, fresh air, sunlight and [illegible] calculated to sustain a vigorou[illegible] contingency of a typhoid or [illegible] Such a course will expedite the separati[illegible] the system in the best possib[illegible] osseous structures that have be[illegible]

[illegible] therefore, interfere till nature [illegible] a single moment, but proceed [illegible] immediately. Dilatoriness is then [illegible] haste was before; for the sufferi[illegible] unnecessarily protracted, necrosis may [illegible] bounds to which it might have been [illegible] constitution may be impaired by the conti[illegible] exhaustion of prolonged suppuration. T[illegible] at the same time to determine when t[illegible] completely loosened. Let them be introdu[illegible] and rested upon different portions of t[illegible] by moving them alternately, a correct opini[illegible] as to whether slight osseous attachments do [illegible] between the living and the dead parts.

In removing a sequestrum, an incision is to be mad[illegible] the soft parts directly to the bone; "neither too free[illegible] unnecessary loss of blood, nor too limited—obstruc[illegible] subsequent procedure by want of space." Someti[illegible] opening or openings through the periosteum and outer [illegible] of bone are large enough to allow the passage of t[illegible] sequestrum; but, more commonly, the scalpel will be nee[illegible] enlarge these cloacæ before the necrosed pieces can be [illegible] away. Great care must be exercised in this latter proce[illegible] for any portions of new osseous formation thereby dest[illegible] will rarely be again replaced. Let the openings throug[illegible] bone, therefore, be as small as possible; and long sequ[illegible] should be cut into two or more pieces by the bone-pliers, [illegible] than destroy new bony formations by attempting ren[illegible]

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of the entire mass. These preliminary steps having been taken, the sequestrum is to be seized with a pair of strong, firm, long-bladed forceps and withdrawn by a steady pull. Never use a pair of slender and weak forceps for this purpose; and, if complete separation of the sequestrum has been clearly diagnosed, never let go the hold obtained upon it, but remove it steadily—breaking down (by leverage) any points that may stand in the way.

The injection of escharotics into the fistulæ has been often advised by surgical writers, the design being to expedite separation of the sequestræ. Such a practice is not only useless, but proves positively injurious by debilitating the soft parts and placing all the integuments in a condition unfavorable for speedy granulation.

After the sequestrum has been removed, layers of soft lint may be placed in the cloacæ, by which the edges of the integuments will be kept open for any after discharge that may be formed and granulation from the bottom be favored. If the integuments remain hard and the cloacæ pass into the condition of weak ulcers, the slow formation of more sequestræ may be suspected to be going on. A thorough course of alterant treatment should be then followed. Sirups of rumex, smilax, arctium, stillingia and similar glandular excitants, may be used, such positive stimulants as guaiacum and xanthoxylum being added when the cases have a mercurial or syphilitic origin. The electro-chemical bath (see p. 445) may be used in mercurial cases, and a system of semi-weekly vapor baths should be advised for all classes of these patients. All the usual hygienic regulations should be ordered, the strength should be sustained by the moderate use of tonics and any typhoid manifestations should be promptly met by the appropriate treatment. The parts themselves are to be treated according to the class of ulcers to which the external sores belong. In syphilitic patients, this may vary between the irritable and phagedenic, requiring relaxing and aromatic poultices and aromatic drinks. In scrofulous persons, the sore may pass into an indolent condition—remaining swel
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great deal of unnecessary pain; and the granules may be broken down to such an extent that it will take weeks to reproduce the number thus ruthlessly destroyed in a few minutes; an artery may be injured by the force used in detaching some of the spiculæ; and, in cases where the head of a long bone is affected, a sharp point may be driven into an articular cavity, to the immediate injury of the joint and with a contingency of deformity. Continue the more moderate use of both the local and constitutional means that were employed during the intensity of the arterial excitement; preserve cleanliness of the parts and enjoin perfect quiet of the limb or portion affected; provide good diet, fresh air, sunlight and every other hygienic influence calculated to sustain a vigorous state of the body and avert the contingency of a typhoid or hectic condition. Such a course will expedite the separation of the sequestrum and place the system in the best possible condition for reproducing the osseous structures that have been destroyed by necrosis.

On no account, therefore, interfere till nature gets ready; then do not delay a single moment, but proceed to remove the sequestrum immediately. Dilatoriness is then as condemnable as too great haste was before; for the sufferings of the patient are unnecessarily protracted, necrosis may advance far beyond the bounds to which it might have been restricted and the constitution may be impaired by the continuous pain and the exhaustion of prolonged suppuration. Two probes may be used at the same time to determine when the sequestrum is completely loosened. Let them be introduced by separate fistulæ and rested upon different portions of the sequestrum; by moving them alternately, a correct opinion can be formed as to whether slight osseous attachments do or do not still exist between the living and the dead parts.

In removing a sequestrum, an incision is to be made through the soft parts directly to the bone; "neither too free—causing unnecessary loss of blood, nor too limited—obstructing the subsequent procedure by want of space." Sometimes the opening or openings through the periosteum and outer lamella of bone are large enough to allow the passage of the sequestrum; but, more commonly, the scalpel will be needed to enlarge these cloacæ before the necrosed pieces can be taken away. Great care must be exercised in this latter procedure; for any portions of new osseous formation thereby destroyed will rarely be again replaced. Let the openings through the bone, therefore, be as small as possible; and long sequestræ should be cut into two or more pieces by the bone-pliers, rather than destroy new bony formations by attempting removal of the entire mass. These preliminary steps having been taken, the sequestrum is to be seized with a pair of strong, firm, long-bladed forceps and withdrawn by a steady pull. Never use a pair of slender and weak forceps for this purpose; and, if complete separation of the sequestrum has been clearly diagnosed, never let go the hold obtained upon it, but remove it steadily—breaking down (by leverage) any points that may stand in the way.

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Necrosis is sometimes sufficiently extensive to threaten life and demand amputation. Such cases, however, are remarkably rare; and the mode of management that has been directed is so efficient in casting off the dead parts and hastening the formation of firm granules, that the most unpromising cases generally yield to its faithful administration. The surgeon must, therefore, be very cautious in determining upon amputation; for that is but an unsatisfying fame which is earned by the flourish of instruments made in rashly sacrificing a limb. Says Prof. Miller (Principles of Surgery, p. 437): "On the one hand we must beware of sacrificing life in vain endeavor to save a limb; and, on the other, we must be equally careful not to sacrifice a limb in our anxiety to succor life not yet brought into actual danger—a dilemma in practice from whose horns we can extricate ourselves only by a happy combination of knowledge, judgment and experience. And, in relation to this subject, it is important to remember that necrosis is not always as extensive as it outwardly seems. Discharge may be copious, fistulæ numerous, soft parts extensively involved and constitutional disturbance great; and still the sequestrum may be of but limited extent, both in surface and in depth."

Rickets.

Rickets is a form of disease affecting the bones of the young, and bearing a rather distant resemblance to scrofula. The earthy matter of the bone diminishes in quantity; the cancellated structure is increased, apparently at the expense of the lamellated structure—the lamellæ being removed till they resemble thin shells; a serous fluid, then a gelatinous fluid, fills the softened cancellæ and, in the course of time, this fluid is organized into a cartilaginous substance. The shaft of the bone diminishes in size and the epiphyses enlarge a little and fail to become firmly attached to the shaft. The weight of the body and the contractions of muscles acting upon the bones when in this soft, yielding condition, force them into various unnatural shapes. The long bones of the lower extremities may be contorted into a variety of curves, either lateral, anterior or posterior. The pelvis is frequently deformed, giving an awkward position to the whole spine. The vertebral column often suffers, the bodies of the bones becoming thinner and the ligaments and cartilages being weak—both conspiring to produce a great variety of spinal curvatures. The bones of the face seem to be atrophied, while the os frontis and inferior maxillary frequently project and give a peculiar cast to the features. There is a general interruption in the growth of the skeleton, which causes rickety persons to be of under size. The shafts of the long bones in the extremities are generally flattened in their lateral diameter. An evident cachexia accompanies all cases of rickets, and the children of the poor, or of those who are forced to live in dark places and unfavorable localities and who are deprived of a sufficient amount of healthy food, are the ones most liable to be thus afflicted. In fact, such influences may be considered as the direct causes of rickets; for they bear upon the frame at a time when the strength is not sufficient to resist their enfeebling tendencies and the assimilative apparatus is incapable of elaborating the coarse and unwholesome nourishment into materials fitted for the consolidation of the bony structures. As the child advances in years, the general health usually improves and the skeleton becomes proportionably more solid—the softened state of the bones ultimately disappearing and nothing but the deformities remaining. Even these deformities sometimes wear away as life advances and the nutritive apparatus becomes strengthened, occasionally disappearing in all the parts except the cast of the face.

Treatment.—Hygienic regulations are to be mainly depended upon in the management of all cases of rickets. A dry and airy situation, plenty of sunshine, good diet and pure water, are to be secured. All depressing influences must be guarded against and every measure taken to strengthen the general health, maintain an even temperature of the skin and prevent the long bones and spinal column from being warped by pressure. The child should scarcely be allowed to use its feet, as deformity is very likely to be the result: it should be carried about and supported, by any light and proper apparatus, in such a manner that it can use its muscles freely without being forced to rest much of its weight upon the bones. Muscular exertion is the best immediate means for consolidating the osseous structures, as it invites a free flow of nourishment to the parts and makes the tendino-osseous attachments more firm. Friction upon the limbs is advisable. Medicine is useless, unless to assist in eradicating a scrofulous or venereal taint, or in regulating the failure of some of the assimilative or secernent organs. It has been suggested that the use of earthy phosphates may relieve rickets by furnishing the system with firmer material to organize into bone.

Such a practice is as unsuccessful in its operation a
incorrect in conception.

Fragilitas and Mollites Ossium.

In both these affections there is a deficiency of the
phosphates in the bones, which become either very
and subject to fracture upon the most trivial occasions,
and capable of being twisted into a great variety of s
They are really two distinct forms of disease, yet pos
many peculiarities in common that they are generally i
ed under one head and have been termed *Osteom*
They seldom attack persons who have not passed the
ian of life; while aged persons, rheumatic patients and
who have been of intemperate habits, are particularly
to *fragilitas*. Cachectic states of the system, mercuri
syphilitic taints, scurvy, scrofula and long confinement t
also favor the same condition of the skeleton, the bon
coming so tender that ordinary motions will break tl
the system not making any attempt to repair the injury

These affections bear a strong resemblance to rheum
from which they can scarcely be distinguished till they
become well developed. Wandering and unyielding
through the limbs, unaccountable emaciation and an
whelming sense of feebleness and high-colored urin
markably impregnated with earthy phosphates), are a
the more common symptoms. Bending of the limb
sudden breaking of the bones reveal the true nature of
formidable difficulties. Thus far, medication has been
tle service—the death of the patient being a certain pr
tive. Tonics, generous diet, good hygienic regulation
the internal use of phosphate of lime, have been sugg
The first three are deserving of confidence and trial, th
is unphysiological and can not be of any service.

Simple Tumors.

Exostosis.—This is a simple osseous growth, deve
(through the regular transitions) from plasma exuded
the surface of some part of the skeleton. Upon the cra
and other flat bones, the tumor grows very slowly, is
less, assumes a very dense, lamellated form and cause
other inconvenience than that of irregularity of external
This is known as the *ivory* exostosis. Upon the long b

especially the femur, the *cancellated* exostosis is formed. It is generally cylindrical, has inner and outer lamellæ and intermediate cancellæ, is enveloped by an elongation of the periosteum and is most commonly connected with the parent bone by a small neck, which is often of a dense structure and seldom enlarges. These tumors sometimes attain considerable sizes and cause much trouble by growing out among the muscles of a limb. At times their positions make them seriously inconvenient, as when they cause aneurism or gangrene of an upper extremity by displacing or occluding the subclavian artery, or lead to death by compressing the spinal cord. Again, they may cause anchylosis by growing from bone to bone in a joint; and they sometimes occasion disphagia by pressing upon the esophagus.

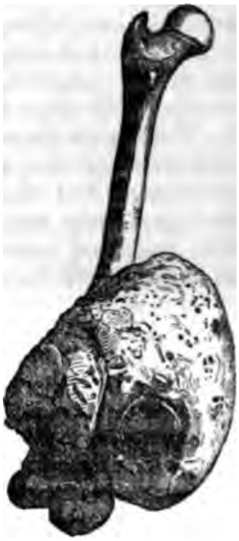
Exostoses may be the ultimate result of blows or other trifling violences. The inflammatory action thus provoked causes an exudation of fibrous material, which becomes firmly organized into a half cartilaginous mass before the vital action subsides, and is then formed into an osseous structure. At other times their origin can not be accounted for. These growths are removed by the knife and bone pliers whenever their sizes and position render them a decided inconvenience; but they should not be meddled with at all unless positively necessary for the comfort of the patient. When operated upon, the incisions should always be free and the edges of the wound left open; for pus is sure to be formed (especially if the bone operated upon is deep-seated) and great mischief will be caused by its forced retention. Maintain good constitutional vigor and favor union of the incised parts by granulation from the bottom of the wound.

Osteoma—Hypertrophy.—Osteoma is properly a hypertrophy of bone, the osseous structure enlarging slowly and persistently without any tangible provoking cause. The structure is very dense, the size is seldom large, there is little or no pain and inconvenience is seldom suffered. At times, however, the size is considerable and the compactness of the structure may cut off vitality in the part, when destruction of the osteoma will commence and serious consequences may follow. Treatment is generally unsatisfactory; but the general principles of management already laid down for all hypertrophies, are to be followed. If the osseous enlargement is neither absorbed nor arrested, it should be removed by the knife; and amputation of a part is occasionally demanded. lest malignant destruction of the growth should commence and the whole system suffer greatly from the exhausti waste.

Enchondroma.—This is a simple cartilaginous tumor, growing either from the cancellated structure of a bone and pushing the outer lamellæ and periosteum before it, or arising upon the outer lamella and being covered with periosteum only. Enchondroma grows slowly, always presents a smooth, spheroidal appearance, no pain accompanies its growth, its size varies from a hazle-nut to that of an orange and it seldom leads to any other unpleasant symptom than that of slight ulceration of the outer integuments. It can be readily removed by the knife; but occasionally its growth is so large that amputation (as of the hand or a finger) may become necessary.

Osteo-cystoma.—These are encysted tumors arising within the cancellæ of the jaw or the long bones. They enlarge slowly, pushing the outer lamella before them and generally attenuating their covering by simple expansion. Sometimes the lamellæ thicken a little and become perforated by irregular openings. There is no pain accompanying the growth and inflammation is very seldom present, in both which respects they are distinct from internal chronic abscess of bone. The contents of the cyst are usually clear and glairy, very seldom of a purulent character, and occasionally are half solid or cartilaginous. They affect adults only, and may attain the sige of a large apple, or even of a cocoa-nut. They present a smooth, oval surface upon the skin, the integuments remaining of their natural color while the veins become a little prominent. In large cystic tumors of this kind, the thinned outer lamella crackles under the pressure of the finger and the fluid under it may even be felt fluctuating, as in ordinary abscesses.

FIG. 52.

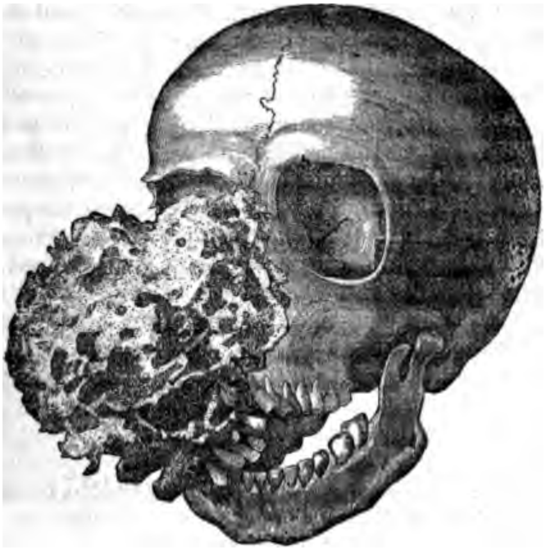


Osteo-cystoma of the Femur.

The contents of these tumors are to be evacuated by careful puncture in the manner directed for chronic abscesses. The strength of the patient must be established before the operation and sustained after it by suitable tonics, stimulants, baths and alterants (see pages 142–145). If the system is well purified and invigorated by these means, the affected parts may be properly replaced and healed up. But if degenerate ulceration supervenes, or if the tumor is large and ulceration has commenced before the surgeon is called, amputation is generally demanded. If the contents of the cyst are solid, the whole tumor is to be removed by the knife, or the part amputated, as may be deemed best. Of course, amputation is only demanded in extreme cases.

Osteo-sarcoma.—In this form of tumor, osseous and fleshy structures are interspersed with each other. The bony portions of the growth are dense and generally of a lamellar form, radiating outwardly from the center of the affected part. The spiculæ interlace with each other, leaving spaces between, and among these spaces the fleshy (mostly cartilaginous) portions of the tumor are deposited. The whole is covered by a membrane, thus resembling an encysted tumor. Growth is moderately rapid, but decomposition of the structures commences before any great size is attained.

FIG. 53.



Osteo-sarcoma of the Superior Maxillary, macerated.—HOWSHIP.

The tumor rarely exceeds the dimensions of an orange; is seldom painful, even upon pressure; is moderately firm, but not elastic, under the finger; emits a very slight crackling sound upon pressure and is not connected by any noticeable constitutional disturbance. Time, or very trifling accidents, may, however, lead to sudden and alarming degeneracy of the parts, which soon pass into ulceration and discharge a moderately foul purulent fluid. Sometimes this open sore is of the simple class and disposes to cicatrize at an early day.

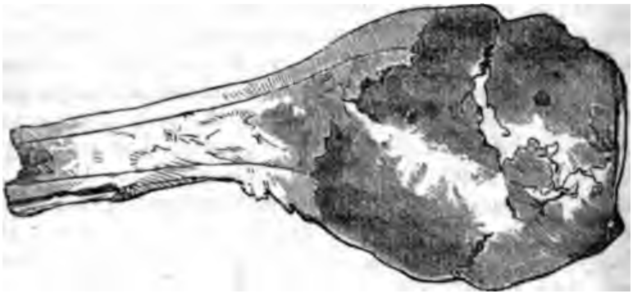
But in scrofulous, syphilitic or mercurial patients, or in those who have been broken in health by intemperate habits, the tumor more frequently enlarges rapidly, suffers excruciating pain, discharges an ichorous and fetid fluid, presents a fungating surface and is followed by marked constitutional cachexy. Under such circumstances, osteo-sarcoma is said to have degenerated to the verge of a true carcinomatous tumor.

The treatment of osteo-sarcoma is very unsatisfactory. The free use of alterants and tonics, with occasional baths, emetics when indicated and good hygienical practices, may maintain the tumor in its simple form and prevent its degeneracy and enlargement. When the size of the tumor increases rapidly, a fungous ulcerating surface forms and the general health fails, amputation is the only remaining hope. Delay allows further degeneracy of the part and an actual carcinoma may be formed. The knife, therefore, although prudently withheld till the last judicious moment, must yet be used promptly and vigorously when it is evident that the above medication can not stay the degeneracy or sustain the vigor of the constitution any longer. After amputation, the patient must be watched with the greatest solicitude and the system purified and invigorated by stimulating tonics, alterants and baths. We have met with practitioners who claimed to possess the means of curing the most degenerate osteo-sarcomæ. This may be possible and it is an end greatly to be desired; but the mystery wrapped around the means used by those who lay claim to such knowledge, at once gives their claims the shadow of imposition.

Malignant Tumors.

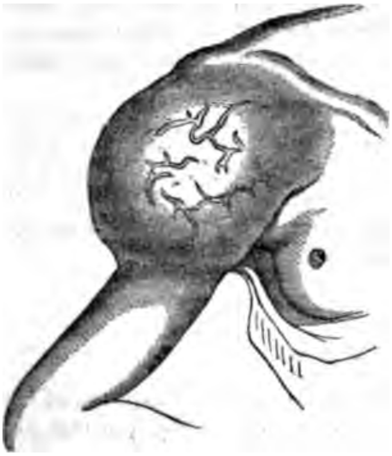
Osteo-cephaloma.—This is the true encephaloid or medullary cancer of osseous structures and generally occurs upon or near the epiphyses of the long bones, especially the femur and humerus. The carcinomatous development may commence in the cancellæ, upon the surface of the medullary canal or among the soft tissues exterior to the bone. In either case, the development is rapid, severe and constant pain attends it and the body is wasted by marked cachexy. If the morbid growth originates internally, the whole shaft of the bone will become infiltrated and the limb will swell rather evenly through its entire length: when the growth commences in the soft parts and affects the bone secondarily, the enlargement is more oval or globular and the skin over it is pale and marked with blue and tortuous veins. In the latter class of cases, the tumor is slightly elastic to the touch; but in those cases where the development is within the outer lamella, the bony covering presents a firm feeling till parts of it become destroyed by the fungous enlargements, when hard, fluctuating feelings will be presented at different points of the tumor. The mass of the growth is of the soft medullary character already described as peculiar to encephaloid tumors of the soft parts (p. 240). The bony development generally assumes the radiated and spiculated forms which characterize osteo-sarcoma. The skin ulcerates sooner or later and a foul, ichorous discharge escapes, with which blood is frequently intermixed. The strength then declines rapidly and death is pretty sure to follow in a short time.

Fig. 54.



Section of Osteo-cephaloma of Femur, showing its medullary appearance.—MILLER.

Fig. 55.



External appearance of Osteo-cephaloma.—ERICH'N.

DIAGNOSIS.—An early diagnosis of osteo-cephaloma is very difficult; and yet it is a practical point of great importance, as timely amputation may save a life which would certainly be sacrificed by delay. It is only by the history of the case and a comparison of a number of the prominent symptoms with the symptoms of other forms of disease, that any satisfactory conclusion can be formed. The following peculiarities generally accompany all cases of osteo-cephaloma: Rapid increase of the tumor, which is of

rather uneven shape and yielding and pulpy to the
severe, constant and lancinating pain, which is great
creased upon pressure; marked sympathy on the part
neighboring lymphatics; rapid decline of health, wit
tinct cachexy; and large and tortuous veins over the s
of the tumor. It is also well to remember that thes
cerous growths are most common to youths and those
early years of adult life; they also arise spontaneously.

TREATMENT.—To eradicate cancer in the soft parts is
the most difficult feats in surgery; to eradicate it fro
bony structures may be at once pronounced an imposs
Amputation of the affected bones is the only chance l
the patient's life, and this must be practiced at an ear
otherwise it will be of but very little service. In the
of the face, amputation may sometimes be impractica
account of the position and extent of the tumor.
performing the operation, the system must be thor
purified and invigorated by alterants, baths, tonics a
other agencies mentioned when speaking of cancer in g
As secondary developments of carcinoma are liable to
operations for this as for all other forms of the diseas
must be taken to make the amputations wide of all en
loid deposit. It is far better to remove a few inch
much from a limb, than to save them at the immine
of provoking cancerous destruction through the who
tem. Even with these precautions, aided by the mos
cious after treatment, amputation is but an unsatis
alternative; for it is not often that life can be prolonge
than a few months, or a year or two at most.

Melanotic cancer of the bones is sometimes develope
the *scirrhous* form of carcinoma is now and then me
These are generally of secondary origin, either follow
the wake of the same form of disease in the adjace
parts, or appearing after an operation for a previous
nant tumor. They are hopeless cases.

Vascular Tumors.

Osteo-aneurism.—This may arise: 1st. From rupture
artery in the cancellated structure, by which the lami
distended into thin shells and ultimately become ver
and even perforated. Numerous arterial branches
open into the aneurismal cavity. 2d. From the d
ment of erectile vascular tissue within the bone in w
great number of interlacing blood vessels will be invo

the whole resembling nerves. In this last variety of cases, or in what is, by some writers, counted as a distinct class of cases, material of a medullary nature may be developed with the aneurismal enlargement. The first two varieties seldom affect any other portion of the skeleton than the articular ends of the long bones, while the encephaloid form may be found upon any part of the body. Distinct pulsation and the ordinary aneurismal bruit, aided by the other individualizing signs of aneurism, serve to distinguish this affection from tumors.

In osteo-aneurisms of the first class, ligation of the main artery leading to the part may be first practiced. If this fails, the part should be excised if possible. Delay in treatment may permit perforation of the lamellæ, when fatal hemorrhage will ensue. In the second and third classes of these cases, direct excision or amputation is alone applicable, ligation being of no avail. Fortunately, these accidents are very rare.

CHAPTER VI.

AFFECTIONS OF JOINTS.

Synovial Membranes.

Synovitis.—Direct violence, as blows and falls—contiguous disease, as rheumatism, gout and caries—and constitutional disorders, as gonorrheal and mercurial taints—may provoke inflammatory action of the synovial membranes. This action is usually intense when it first commences, causing acute pain, swelling and heat in the surrounding parts. The synovial membrane thickens and a glairy, plastic fluid is thrown out in large quantities, causing enlargement and stiffness in the joint and puffing out the synovial sac to an enormous size. Fibrinous material is sometimes thrown out and organized into a low, vegetative mass, which may remain for years and cause permanent disability of motion. The limb is always maintained in a flexed position. If the acute inflammation subsides partially (a low, chronic excitement continuing), the swelling, weakness and stiffness of the joint will continue, pain of a moderate degree is generally an attendant, and the accumulation of synovial or serous fluid may remain, forming what has been denominated *hydrarthrosis.* The knee, elbow and hip joints suffer oftenest, though any exposed joint in the body may be affected. The swelling and fluctuation in the part are easily distinguishable, but care must be taken not to confound them with purulent accumulations and proceed to puncture the sac, as such a mistake might, and generally does, lead to very grave results.

TREATMENT.—Simple relaxation of the parts is all that is needed in acute synovitis. To secure this, the joint may be wrapped in a poultice of lobelia seeds and ulmus. Tincture of lobelia may be also used to saturate a flannel wrapped around the parts; a mush or bread poultice may be used, the surface being thickly sprinkled with lobelia and the whole frequently moistened with an infusion or tincture of the same. An iron or brick heated, wrapped in wet cloths, placed near the joint and then covered with a quilt, will prove an excellent relaxant. It may be employed alone or in connection with poultices; or local vaporizing, alternated with the relaxing applications, may be made to constitute the whole local treatment. On no account disturb the flexed position of the joint. Constitutional treatment is not demanded in cases that arise from violence; but when synovitis is provoked by any general or local form of disease, it can be relieved only by the means best calculated to cure the provoking difficulty. As the patient recovers, the joint should be exercised *very* cautiously and moderately till its usefulness is restored.

Synovial Abscess.—Any accident or circumstance that will prove a provoking cause of synovitis, may be sufficiently extensive to enfeeble the nourishment in the parts and ultimately lead to congestion and suppuration. The synovial membranes remain thickened, as in synovitis, and the serum effused into the sacs passes into decay. The fibrinous exudation becomes a pyogenic membrane and pus molecules are thrown out upon its surface, as in abscess of the soft parts. The swelling increases gradually, the adjacent structures exhibit an inflammatory excitement in consequence of the impression of increasing danger being conveyed to them, the skin becomes hot and red and the pain extends for some distance in every direction around the joint. A succession of rigors and the usual arterial throb usher in the process of destruction, and are important diagnostic items. Constitutional excitement (fever) soon follows. Fluctuation in the sac is not as marked as it was before, the fluid being thicker and giving a heavier impression than that conveyed by simple sero-synovial exudation. As destruction advances, the synovial membrane will be perforated and its sero-purulent contents discharged. There is then an abatement of the constitutional excitement and the patient obtains a few hours comparative rest. The exposure of a joint, however, is no trifling matter, as will be soon manifested by the irritative form of febrile effort and rapid exhaustion of strength which frequently follow the discharge of synovial abscesses. If reparation is not soon commenced, the destruction may advance to an extent that will disable the joint; and the continuance of the suppuration may lead to a series of hectic manifestations. It is seldom, however, that this latter degree of seriousness occurs—the strumous, the feeble and the poorly managed, being the persons who are most likely to sink into such a grave condition.

TREATMENT.—The possible contingency of synovial abscess urges the practitioner to treat synovitis with all the means and all the energy he can command; for it is only by softening the parts and allowing the continuance of a free circulation through them, that this unpleasant casualty can be averted. If the treatment should fail, no alternative is left but to sustain the constitution and secure the discharge of the pus as early as possible. For the former purpose, use vapor baths, aromatic drinks, enemas, hepatic relaxants, emetics when indicated, lobelia pills and tonics, according to the necessities of individual cases (see pages 133–141). The treatment must be pushed vigorously, for there is not a moment to lose. The limb must be kept flexed and comfortable and the patient quiet. When it is evident that pus has formed, a free incision must be made, as in all other cases of abscess, and the matter allowed to escape. Great caution, however, must be practiced in the use of the bistoury in these cases; and the surgeon who calls instruments to his aid before he is *positive* that the contents of the sac are purulent, may regret his rashness. While the enlargement presents an even surface, wait; when pointing is seen upon its aspect, and rigors and fever have previously occurred, make an incision at once. Sometimes the decay proceeds slowly, the abscess belonging to the chronic class. Purulent material may then remain in the sac for a long time without causing mischief, and it is better to let it remain there than to do injury by puncturing the sac upon a mere supposition. Such cases are usually tractable to the treatment advised on pages 142–146, and should never be interfered with till it is plain that destruction of the joint is in progress. When opened, a fine, grooved needle should be used and the precautions advised for other chronic abscesses should be taken.

The arterial excitement that arises after the discharge of these abscesses, is to be managed according to its grade. The patient must be kept perfectly quiet and every organ main-

tained in free action, that not an atom or morbific ma
may be retained to depress the system and retard the cl
of the wound. Poultices upon the joint are seldom advis
but simple or medicated water dressings are to be use
cording to the indications present. Granulation from th
tom of the wound is desirable, and the skin must be
apart to allow the escape of purulent materials. The
wound seldom needs any interference, but the cure de
upon the state in which the system at large is kept. I
sore degenerates, however, it must be managed accordi
the class of ulcer to which it belongs. The joint mu
moved *very* cautiously after the wound has healed; and i
be many months before an ordinary degree of mobilit
be attained, while stiffness may remain for life.

Hydrops Articuli—Hydrarthrosis.—These terms are us
designate an accumulation of serous fluid within a sy
membrane. This accumulation is a direct exudation e
by chronic inflammatory action in the parts. The
bulges and presents a soft, fluctuating tumor; it enlarges
ly, is only moderately painful and rarely accompanied b
symptom of inflammation upon the surface; the joint
ways stiffened and kept in a flexed position, and the i
fluid may ultimately degenerate and lead to the destr
of the tissues. Persons in adult life are most usually aff
the knee joint is the most common seat of the difficult
exposure to cold and the use of mercury, are the most
mon provoking causes.

In itself, hydrops articuli seldom amounts to anything
than an inconvenience. The tissues, however, are alw
a debilitated condition, and a very trifling accident ma
voke a more active inflammation, when the fibrinous e
tion may be organized into a semi-cartilaginous structu
produce spurious anchylosis. In patients of a strumou
thesis, the serous fluid may dengenerate and lead to su
tion.

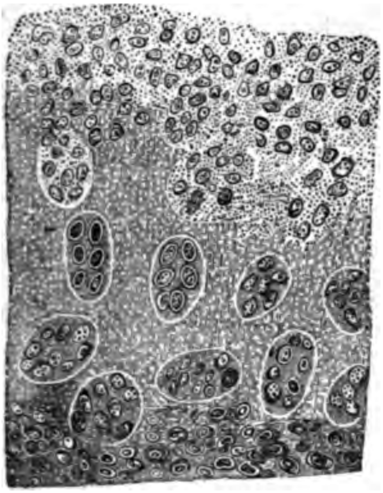
These cases are to be treated by the daily use of local
baths, bathing the joint with washes of lobelia and p
num or origanum, general vapor baths occasionally,
clothing always and tonics to maintain good digestion.
ments made of tincture of lobelia for a base and oil of orig
sassafras or absinthium, added to it in *small* proportio
useful to apply after the baths, not only to the joint, l
the whole body. The local baths may be medicated
abies, marrubium, absinthium and similar agents. The b
must be maintained in a soluble condition, the stomach
not be allowed to become unhealthy and stimulating

must be used whenever the general circulation is feeble. Persevering treatment is necessary to effect a cure. Blisters and irritating applications are worse than useless, often provoking serious articular destruction.

Cartilages.

Simple Destruction.—Cartilages are not liable to inflammatory excitement, for they possess no circulation. Their *destruction* will occur whenever the chemical laws obtain control over the vital power which possesses them. This destruction commences in a slow enlargement of the corpuscles and an increase of their nuclei. As the enlargement advances, the corpuscles approach the free surfaces of the cartilage, finally burst and discharge their nuclei into the matrix, which has become minutely fimbriated and divided into villous shreds by the progress of decomposition. The cartilage may be destroyed over only a narrow portion of its surface; or it may be gnawed into shreds and perforated to the very bones; or portions of it may be loosened off in the form of sloughs and remain floating in the cavity of the joint. The disintegration may extend from the cartilages to the bones; or it may commence in the bones or synovial membranes and extend to the cartilages When the destruction of tissue continues for a length of time, all the structures of the joint may become excited and an active inflammation established. An earthy deposit will be ultimately thrown out; the joint is always stiffened and permanent anchylosis sometimes results.

FIG. 56.



Diseased Articular Cartilage, magnified 240 diameters, showing the enlargement of the corpuscles.—REDFERN.

The *symptoms* of this destruction begin as a simple uneasiness and stiffness in the joint. In a few days, or weeks, a deep, circumscribed pain is felt, and this always increases at night. When the destruction is extensive and the other portions of the joint become implicated, very decided local and constitutional excitement is manifested. Pain is severe and may extend along the limb for some distance; the muscles around the part frequently become atrophied; swelling is moderate in extent, appears late and increases slowly; suppuration advances steadily and abscess of the joint (in most respects resembling synovial abscess) ultimately results. The cartilages may be destroyed to an extent that will allow the bones to slip from their places, and an open abscess soon prostrates the system and hectic supervenes.

TREATMENT.—The limb must be maintained in a motionless position from the first, splints being employed for this purpose. The treatment is then to be in all respects similar to that for synovitis—local and general relaxation being freely employed when inflammatory excitement appears in the other structures of the joint, and relaxation with the stimulating washes used for hydrops articuli when the cartilage alone is affected and the difficulty is chronic in its progress. When a mercurial or syphilitic taint exists, alterants and general vapor baths must be pushed vigorously. Much time and patience are necessary, for these are slow and tedious cases and months may be required for their cure. Sometimes all remedial efforts are of no avail and a rapidly ulcerating joint leaves no alternative but amputation. These are rare cases and a thorough course of proper medication will almost always do away with the knife.

Scrofula of Cartilage—White Swelling.—This can not be pronounced as anything but chronic decay of all the structures of joints, occurring in scrofulous persons, arising from scrofulous influences and *provoked* to development by some trifling accident. At first there is but little pain felt, except upon motion; the joint enlarges slowly and presents a doughy, pulpy swelling, but no fluctuation; the skin generally remains of its natural color, though the synovial membranes may be involved and moderate inflammatory excitement be developed; the joint is rigid and half flexed, and atrophy of the limb will follow in time. After a few weeks, or a few months, the patient evinces very prominent cachexial symptoms, pain in the joint increases, paroxysmal arterial excitement is noticed and suppuration soon commences. The swelling fluctuates, from the presence of pus; the joint becomes more lax and, when all the structures have been involved, may be moved in every direction with comparative ease; ultimately, the abscess bursts, and then disintegration proceeds rapidly and the patient soon sinks into hectic. Strumous deposition generally takes place in the lungs and death is very probable.

TREATMENT.—When the swelling is indolent, suppuration can be prevented only by the use of constitutional means, and these must be of the same nature as those advised for scrofula in general. Vegetable diet, stimulating alterants with the greatest freedom, vapor baths and thorough friction daily, emetics frequently and close attention to the state of the bowels, are the means to be relied upon. The attendant must work vigorously, for these are obstinate cases. If inflammation is established and the pain increases, poultices of lobelia seeds in elm must be applied unstintingly and the vapor baths and emetics continued as before. Constitutional irritation may be quieted by relaxants and aromatic drinks, *large* quantities of lobelia being needed to produce any impression—a fact of importance to remind the practitioner to not stop at any ordinary amount of medication. Pursue this course vigorously and, if it does not prevent suppuration entirely, it generally limits it in extent and confines it to the more superficial structures, when the abscess can be punctured with safety and a few weeks more of the constitutional treatment will restore health. When the whole joint is involved in suppuration and the strength fails rapidly, the same constitutional treatment must be employed. It is not too much to give an emetic and bath every day, following them with alterants and tonics in abundance and treating hectic symptoms when developed. Energy and decision in this course generally check destruction in a month or two, and limb and life may be saved: inactivity or indecision will allow the favorable day to pass, and even amputation may not then save the patient.

Loose Bodies in Joints.

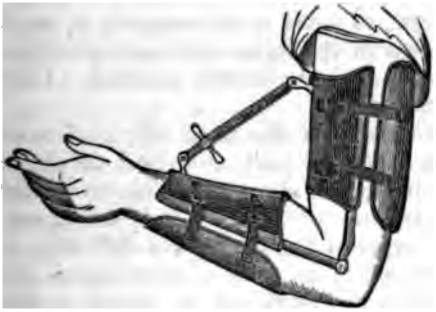
The knee joint is occasionally afflicted with the presence of loose bodies, which are of a fibrous structure and generally of the consistency of cartilage. Their mode and sources of development are subjects of various speculations. They seldom cause any uneasiness, but may be distinctly felt lodged in the soft structures, varying greatly in number, size and position. When, however, these bodies get entangled with the moving portions of the joint, they cause very grave mischief—not only provoking inflammation and unendurable misery, but directly interfering with motion and occasionally leading to serious destruction. An elastic knee cap may be worn constantly and will generally prove sufficient to keep the bodies out of the central portions of the joints. When this fails, the patient's system may be toned up and cleansed and then placed under the influence of relaxants, preparatory to an operation. A very thin bistoury is passed cautiously and obliquely through the integuments and the synovial membrane. The instrument is then withdrawn carefully, the point being followed by the finger and the wound being immediately covered with collodion or some other air-tight material. The body is then to be gently and very slowly worked through the synovial membrane and to the outer wound. A few days may be allowed to pass in perfect quiet before finally withdrawing the body, as that will give the wound in the synovial pouch an opportunity to be closed and air will not then find its way into it. Great prudence and cautiousness are to be exercised in this operation, for haste and carelessness may prove serious, if not fatal. If inflammation is provoked, the treatment directed for synovitis must be pursued. Should suppuration occur, the case is in all respects a synovial abscess, and is to be managed accordingly. The operation should never be undertaken except upon the most urgent occasions.

Anchylosis.

Anchylosis consists in stiffness of the joints, caused by either fibrous or osseous organizations built up between and around the articulating bones. Inflammatory action in the parts is always necessary to the production of anchylosis; for the organization of fiber or bone depends upon the effusion of plastic material, which, in turn, can only take place by the aid of excited arterial action. When synovitis, arthritis or any other variety of inflammation, has been provoked (whether by caries, ulceration of cartilages or synovial membrane, articular fracture, or dislocation), anchylosis is liable to supervene. The effusions may be trifling and confined to the edges of a few ligaments, causing nothing but temporary stiffness; or they may extend through all the parts of a joint and beyond the edges of the articulation, uniting the bones with unyielding bands. The fibrous form of organization is the most common, as well as the most amenable to treatment; the osseous form occurs only in the very robust and is seldom remedied.

TREATMENT.—When stiffness of the joint is so great as to not admit of the least motion, it is hazardous to interfere with it; when limited mobility still exists, a cure may be effected and the parts again rendered useful. This can be done only by breaking up the adhesions and organizations by force; and, when we consider the nature of these adhesions and the ease with which fatal decay may be provoked in a joint, it is self-evident that the anchylosis should not be interfered with in any except comparatively trifling cases. Force may be applied either by the hand of the surgeon or by a screw apparatus made of that shape which will be most appropriate to the form of the joint. The force should be applied from day to day, moderately and without causing pain to the patient—local vapor and douche baths, embrocations and friction being, at the same time, used freely. Much care is to be observed lest the force should be applied too suddenly and carried too far.

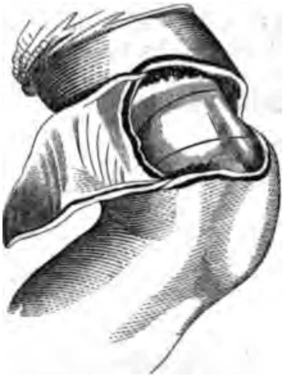
FIG. 57.



Apparatus for breaking Anchylosis.

Dr. Barton, of Philadelphia, introduced a method of forming a false joint in cases where the anchylosis is complete and holds the bones in an unnatural position. It consists in laying the bone bare by a V-shaped incision, drawing the integuments back and then removing a wedge-shaped piece of the bone by the saw. The base of the wedge is to be of that size which may be deemed necessary to bring the limb into a proper position. The saw should not be carried entirely through the bone, lest the vessels beyond the part (as in the popliteal space) should be injured; the few shreds of structure that remain can be easily severed by flexing the parts steadily and then the bones can be brought to their proper positions and the wound closed. The limb should be carefully sustained by side and back splints and the health demands the closest attention. Plasma is thrown out upon the sawed ends of the bone, soon becoming gelatinified and ultimately forming a firm and smooth cartilage. By performing passive motion daily after the end of the second week, an articulating form will be given to this cartilage and a comfortable degree of usefulness may be obtained. The operation

FIG. 58.



Barton's operation on the Femur for Anchylosis of the Knee.—PANCOAST.

has been performed with excellent success in anchylo
the knee and hip, but should be undertaken only in ex
cases.

Other Affections of Joints.—Joints are liable to be sti
by *earthy deposits*, which may occur after, or in conn
with, destruction of cartilage, or arise spontaneously in
persons. Ossification of some of the ligaments may als
place in the aged, or in gouty and rheumatic patients.
is impracticable in all these cases.

Absorption of bone, particularly of the neck of the f
may follow slight violences over the part, and lead to
shortening of the limb. Old people alone are liable to i
they may suffer thus after trifling accidents. It is not
able to treatment, but the surgeon should fix the difficu
his mind and not be misled when he sees shortening
limb in an aged person who had suffered an injury
weeks before the deformity was discovered.

The bones of joints are liable to *caries* and *necrosi*
these forms of disease have already been treated of and
occurence in special joints will be still further discus
the chapters upon affections of the extremities.

Wounds of Joints are very serious accidents and de
every care the surgeon can possibly bestow upon them.
principles upon which they are to be managed are, ho
in all respects the same as those directed for wounds in
parts, to which chapter the student is directed. One i
tion may be here repeated, never explore a wound in a
nor meddle with it in any way, except when forced to
direst necessity.

CHAPTER VII.

AFFECTIONS OF THE ARTERIES.

Arteritis.

ACUTE inflammatory action upon the inner coats of a
may be provoked by wounds, ligation, external violence
pressure or any other influence that will excite inflamn
in other structures. The action (with its provocation) i
erally confined to a limited portion of the circulatory v
but occasionally extends along a series of vessels.
febrile manifestations, of an asthenic and irritative for
present from the first; the pulse is feeble, jerking and gra
diminishes and recedes; the artery feels swollen and indu

and acute pain, which is increased upon motion or pressure is felt throughout its track. The sero-fibrinous infiltration, consequent upon the local excitement, may partially or totally occlude the blood vessel. As this infiltration advances, the pulse becomes more imperceptible and may finally be wholly lost; the limb feels stiff and muscular power is weakened in exact proportion to the diminution in the supply of nourishment; pain becomes acutely severe, is of a stinging character and extends beyond the immediate track of the affected artery; coldness of the distal integuments and (if the occlusion should be complete) ultimate gangrene are observed. If the arteries alone are occluded, the gangrene is of the *dry* kind; if the veins are simultaneously affected, it partakes of the *moist* character (see *Mortification*). The arteries of the extremities are the ones most frequently engaged in these vital demonstrations; but the internal vessels, even the aorta itself, may be the seat of inflammatory action and fibrinous exudation. In these cases, constitutional grossness, or a local tendency to ossification, may be the provoking cause of the inflammation.

TREATMENT.—Relaxation is indicated, mildly diffusive stimulation being also sometimes called for. Lobelia and ulmus poultices over the part, lobelia pills with drinks of salvia, mentha, nepeta or eupatorium, drinks of lobelia in intense cases, enemas to unload the bowels, asclepias and mild vapor baths when the skin is hot and dry, galium and seeds of arctium lappa when the urine is not free, zinziber and aristolochia, or the third preparation of lobelia, when the pulse becomes tremulous and the parts feel cold, and emetics and searching vapor baths when morbific accumulations weigh down the system, are the means to be relied upon. The management is thus seen to be in all respects similar to that for inflammation in general; for (as has been already stated), inflammation, being a vital effort, is always of the same nature and can be always relieved by those means which are best calculated to loosen the tissues and aid in the removal of offending materials. In arteritis, these means must be pushed with the utmost vigor, otherwise the impediments which provoked the inflammation may procure congestion, to which supuration and death are likely to follow.

When mortification occurs, the principles which guide the practitioner in its management (see pages 197–203) must be followed.

Chronic arteritis is always accompanied by either fatty or calcarious degeneration, which stand in the relation of exciting causes to the vital effort. Such changes weaken the arterial coats and favor the formation of aneurisms. They depend upon constitutional degeneracy and are seldom amenable to treatment.

Erysipelas.

The arterial coats are occasionally subjected to poisonous influences, which incline to the speedy formation of pus and provoke inflammation of the erysipelatous quality. Persons beyond the middle period of life are most liable to it, and it usually follows upon habits which undermine the constitution—as hard drinking, mercurial and venereal taints and poisoned wounds. Rude handling of the vessels during an operation, blows and external violence, may provoke its development in persons thus enfeebled. The whole arterial system may be thus affected, or the poisonous influences may extend to only a moderate portion of it. Febrile excitement is ardent, but of the irritative quality; pain along the course of the artery is burning and a claret color extends from the point of infection both toward and from the heart; livid vesications appear upon various parts of the body; pus forms rapidly and passes the round of the circulation; typhoid symptoms soon manifest themselves; pyæmia then sets in and death closes the scene.

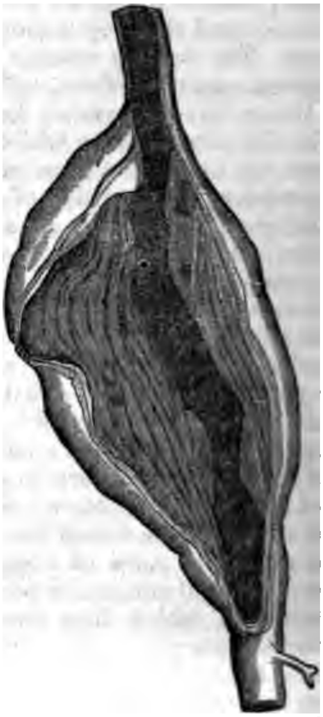
Treatment can be effectual only when it is early and thoroughly applied. The general plan of management proper for other forms of erysipelas is the one to be followed; but, as this form of the difficulty is most intimately connected with the general state of the system, constitutional treatment is the only kind likely to prove of much advantage. Emetics must be thorough and frequent—two each day being none too many during the whole continuance of the affection. The drinks for these emetics should be pretty stimulating, as weak infusion of Dr. Thomson's composition, zinziber, asarum and myrica, with small proportions of capsicum, aristolochia and zinziber, and similar agents. Daily and thorough vapor baths are invaluable, the bowels must be kept open and the general state of the system must be diagnosed and managed accordingly as typhoid or irritative febrile symptoms manifest themselves. Death is almost inevitable when livid spots appear, and the difficulty is seldom tractable to medication.

Aneurism.

An aneurism is a tumor formed by the distension of the arterial coats, pulsating under the finger and partly filled with coagulated blood. The distension occurs from feebleness of the vessel, induced either by fatty degeneration or ulceration of the inner coat. All such cases are termed *true* aneurisms; while the term *false* aneurism is applied to those pulsating tumors which are formed outside of an artery that has been severed either by wound or ulceration of the whole arterial wall. The tumors assume different shapes, being sometimes globose, again fusiform, cylindroidal and even pedunculated. Authors have separated them into the following varieties: 1st. The *sacculated*, in which the coats of the vessel gradually give way before the impetus of the blood, forming an abrupt enlargement on one side of the artery, the sac of the tumor having a narrow neck or aperture communicating with the tube. 2d. The *dissecting*, in which the inner coat of the artery is eroded and the other coats become separated from one another and filled with infiltrated blood. The current of the circulation forces the coats apart for some distance, usually giving a cylindroidal form to the tumor. The blood may regurgitate from the distal extremity of the sac, or an aperture may be formed, reaching the artery several inches beyond the site of the original erosion and allowing the side current of blood to again return to the natural channel of circulation. All aneurisms that have a distinct cystic covering are said to be *limited;* those which have no such covering, but consist in an excavated mass of coagulum, are termed *diffuse.* These several technicalities are convenient in pointing out the peculiarities to which they severally relate, but serve no other practical purpose. All the arteries of the body, from the aorta to the phalangeal, are liable to aneurisms, the carotid, brachial and popliteal vessels suffering most frequently.

CAUSES.—Fatty degeneration of the arterial coats is the great predisposing cause of all aneurisms. This degeneration enervates the vascular tunics, rendering them less and less able to recover themselves after the systolic tension of the fibers and thus allowing dilatation of the tissues. At first, the dilatation is very inconsiderable, but it gradually increases till a tumor of the largest size is formed. The coats of the vessel may remain entire, giving way gradually and forming a large eddy into which the blood whirls with a diminishing force that favors the formation of coagula; or the degeneracy may proceed to such an extent that the inner tunic becomes ulcerated, giving way before the impetus of the blood and allowing this fluid to permeate between the several layers of the arterial wall. In the first form (simple dilatation) the aneurismal sac is almost continuous with the blood-vessel; in the latter form, the aperture to the tumor is small, being generally oval or circular, though it is sometimes in the form of a long, narrow slit—as is most common in dissecting aneurisms. Rupture of the vessels, however, does not always take place by simple ulceration, but is generally caused by sudden muscular exertion. The thinned coats of the tube are not capable of resisting any more violence than the impetus of the sanguineous current; and now, when some sudden effort is made, or even when the exertion is no greater than that employed in walking, the inner tunic suddenly gives way before the force of the muscles covering the part. The patient is usually aware of the existence of the rupture at the moment of its occurrence. The angles of the arteries are the points most liable to fatty degeneration and hence suffer most frequently from aneurisms. Old persons are more liable to them than young persons; men suffer more frequently than women; intemperance strongly favors their development; and there even seems to be an aneurismal diathesis, some persons being afflicted with numbers of small tumors of this kind.

FIG. 59.



Aneurism by Dilatation. The abnormal space entirely filled up by fibrin, the arterial canal remaining clear.—MILLER.

SYMPTOMS AND PROGRESS.—A small swelling in the course of an artery is the first monition of a developing aneurism. This swelling enlarges gradually, is soft, disappears under pressure but immediately returns upon the removal of the compressing force and pulsates distinctly at each impulse of the heart. The thrill of the pulsation can be clearly perceived by placing the hand upon it, and a *bruit*, or rasping sound, is plainly distinguishable by the ear. In the course of time, which may vary from a week to a year or more, the inner coat of the artery gives way, allowing the blood to distend the more yielding outer coats much more rapidly than the tumor enlarged before; the sac becomes lined with coagula and the pulsation and *bruit* are manifested with increased distinctness. The coagulated blood increases in thickness, layer by layer, and gradually passes into a low fibrinous organization. In the majority of cases, the dilatation of the sac keeps pace with the organization of the coagulum, thus maintaining something of a uniformity in the size of the free cavity. In some instances, however, the outer coats do not yield very readily, the fibrinous organization is firm, the cavity becomes slowly filled and is ultimately obliterated. These cases of spontaneous cure are rare.

As the fibrin of the coagulum separates and attaches itself to the wall of the cyst, the tumor becomes firmer and less compressible; as organization advances, it becomes decidedly hard and does not yield readily to ordinary pressure. Pressure upon the cardiac aspect of the artery, however, causes distinct diminution of the size of the aneurism, at the same time lessening the force of its pulsations and the clearness of its *bruit*. The patient is usually aware of the pulsating nature of the enlargement, distinctly noting the moment of rupture and realizing the thrilling character of the tumor.

As the aneurism enlarges in size, it causes unpleasant, if not fatal, effects by pressure upon contiguous parts. The circulation through the affected artery is at all times diminished and the limb has to depend very much upon the collateral circulation for its support. If the tumor compresses the veins, or pinches the nerves against the bones, the whole circulation will be impeded and edema, paralysis or slow mortification, may ensue. Severe pain may be suffered in some cases, numbness is prominent in others. Disphagia may be produced by pressure upon the esophagus, vertigo and partial apoplexy when the jugular vein is crowded, and the functions of other parts may be seriously affected in the same way. Digestion fails, sleep is disturbed and the system becomes gradually exhausted.

An aneurism may be diffused, from the first, but is more frequently limited and may become diffused after the lapse of several months. The external coats of the artery give way suddenly, the blood rushing out among the tissues of the part, the patient usually suffering a shock at the moment. The size of the tumor is greatly increased, the distinctness of the pulsation and *bruit* is lessened, edema of the limb usually follows in a short time and fatal gangrene is strongly probable. Death can not be averted under such circumstances.

Aneurisms continue their process of enlargement, till, ultimately, they terminate in rupture and lead to death. Rupture may occur: 1st. By simple laceration of the walls of the sac—an uncommon accident and one that is usually averted by the resistance that the fibrinous organization offers to the impetus of the blood. 2d. By ulceration of the sac, which is the most common mode. 3d. By absorption of the outer wall in consequence of the pressure of the adjacent structures. Absorption alone may so attenuate the sac that the force of the current will prove sufficient to cause its laceration; but it is generally associated with ulceration (or even gangrene) upon the inner surface of the cavity. Aneurisms may prove fatal either by the exhaustion of hemorrhage (especially when the sac opens into some of the natural cavities), by pressure upon vital parts, or by purulent accumulations (within the sac) leading to hectic and pyæmia.

DIAGNOSIS.—The diagnosis of an aneurism is a point of vital importance, yet is frequently baffling and sometimes impossible, especially when deep-seated. If it is confounded with an abscess and punctured, the termination is speedily fatal. If it is considered to be a tumor and left to pursue its own course, the favorable moment for operation may pass before the error is corrected. The surgeon should be exceedingly careful, therefore, in his examination of a patient troubled with an enlargement in the course of an artery. The following considerations will aid in establishing a diagnosis:

From an abscess, aneurism may be distinguished by the history of the case—an aneurism being soft and compressible at first and gradually becoming hard and firm, an abscess being hard at first and soft afterward. A few abscesses are soft at first, but the feeling is rather doughy; pressure may even cause the partial disappearance of the abscess, but the removal of pressure is not followed by that quick and bounding return of the tumor that is peculiar to an aneurism.

Between aneurisms and other tumors that pulsate (either from being composed of erectile tissue or situated along the track of an artery), there are many striking similarities. In either case, the size of the tumor may be diminished or removed by pressure; but the return of the blood takes place with a mild fluctuation in other pulsating enlargements and with a sharp throb in aneurisms. The pulsation of an aneurism is noticed from the first, while other swellings evince no pulsation till they have existed for some time and increased to a considerable size. A pulsating tumor has its throb either diminished or entirely removed by being lifted upward from its circumference; an aneurism beats with equal force on all sides and at all times, elevation of it making no difference with the fullness of its pulsation, neither is an aneurismal impulse much diminished when the enlargement is pulled to one side, while the pulsation of any other tumor would disappear under similar handling. "Pressure on the cardiac aspect of the aneurism diminishes its pulsation, bulk and thrill; pressure on the distal aspect has a precisely contrary effect. Another tumor may have its apparent pulsation similarly affected, but the *pulsation* only" (Miller).

It has been already remarked that spontaneous cure sometimes occurs in aneurisms, the fibrin of the coagula becoming organized against the walls of the sac and gradually obliterating the cavity. The surgeon can occasionally aid this cure by medication, or constitutional treatment, adapted to the requirements of individual cases. In the young, robust and plethoric, the vigorous impulse of the arteries must be steadily abated, too strong a current in the blood not being favorable to the formation of either coagula or fibrin. The daily use of lobelia and boneset pills and unstimulating vegetable diet, and the steady maintenance of a perfectly quiet life, are especially favorable to this result. In old, anæmic and feeble patients, a generous diet is to be allowed, digestion sustained by stimulating tonics (as hydrastis) and every means taken to restore the vigor of the frame and increase the plasticity of the blood. In either class of cases, the appropriate mode of management must be steadily pursued for weeks and months before any marked benefit can be expected, and freedom from both physical and mental excitement is at all times necessary. In a few instances, a permanent cure has been effected in this way; but even when no such favorable result can be wrought by this mode of management, it places the frame in a position the most favorable to the success of an operation.

Two principal modes of procedure have been adopted in the surgical treatment of aneurism; namely, *compression* and *ligation*.

1st. *Compression.* This is applied by means of a carefully padded tourniquet (purposely constructed for aneurisms), which is fixed at a point varying from two to nine inches upon the cardiac side of the tumor. The patient is placed upon a suitable bed, the point of application of the tourniquet shaved and dusted with powder to anticipate irritation of the skin, and the instrument then adjusted. The degree of pressure is to be very moderate—not sufficient to obstruct the circulation of the artery, nor even to produce congestion of the capillaries. The intention is simply to retard the velocity of the arterial current, that coagulation and the organization of fibrin may be favored and nature's attempts at spontaneous cure thus assisted. If severe pressure is applied, the patient is always made irritable, erysipelas in the part may be provoked and life itself may be jeoparded by arterial suppuration, or gangrene of the limb. In order to obviate these unpleasant results, it is not only proper to make the pressure moderate, but the tourniquet may be gradually loosened, and then removed, as soon as the patient becomes irritated. In a few hours, or within a day or more (according to the continuousness of the excitement), the tourniquet may be again applied. By thus alternately applying and removing the pressure, at the same time using lobelia and relaxing nervines to soothe the system and enemas to unload the bowels, quite favorable results may be obtained and the cure of recent and small-sized aneurisms is very commonly effected. By employing two tourniquets (one at a distance of several inches above the other) and loosening and tightening them alternately, a steady retardation of the blood may be obtained and the patient not suffer from any special irritation.

The surgeon must always bear in mind that pressure is not the direct means of cure—this is effected by the vital force coagulating the fibrin within the aneurismal sac. Therefore, not only must the pressure be very moderate, but the general state of the system must be carefully attended to both before and during the application of the tourniquet. The patient should be so managed as to have his health improve, rather than fail, under the use of the compress; for this will not only assist the cure, but will leave the system in a condition favorable to the application of the ligature in the event of treatment by compression failing. Much patience is required in managing an aneurism in this way, the diminution of the tumor being very gradual and several weeks being required to effect a cure, even in the most favorable cases.

2d. *Ligation.* This is a very ancient, but by no means the most successful, mode of treating aneurisms and may be employed as a dernier resort when the application of pressure has failed. Before it is resorted to, the system should be well purified by alterants, and either quieted by nervine relaxants or strengthened by generous diet and tonics, according to the age and condition of the patient; for there will be need of all the health and resisting capacity that can be commanded. Having thus prepared the patient, the artery is to be cut down upon and ligatured according to the manner already described in the treatment of *Wounds* (p. 305). The point chosen for ligation should be on the cardiac side of the aneurism and sufficiently remote from the tumor to escape the least possibility of involving any degenerated arterial fibers in the knot. It was formerly the practice to tie the artery upon the distal aspect of the sac, or to tie one of the branches beyond the first distal bifurcation. Neither of these operations is correct and can accomplish but little good, and they are both liable to lead to serious results. The cardiac operation (introduced by Dr. John Hunter) is the only one that should ever be practiced, except when rendered impossible by anatomical position:

"The original want of practical success [in applying the ligature] resulted from the faulty mode in which it was used. There existed, in the profession, an excessive dread of injury to the arterial coats by a small ligature tightly applied. It was feared that they would be cut through too soon, ere yet the canal had become consolidated, and that the most serious hemorrhage would ensue. Accordingly, broad tapes were tied on and others were applied loosely, to be tightened as circumstances might demand. * * Success depends mainly on a skillful use of the ligature, and too much caution can not be used in its application. The vessel is exposed by careful dissection, somewhere on the cardiac side of the aneurism, not so close as to endanger the encountering of degenerated coats, not so far removed as to favor too free a collateral supply of blood still remaining to the tumor. The external wound should be rather too large than too small, facility and safety of performance being closely allied in this operation. * The vessel having been exposed, its sheat (pinched up by dissecting forceps) is opened to the extent of about half an inch and (by repeated touches of the knife's point, assisted by forceps) the arterial coats—looking at last white by the insulation—are completely detached from all neighboring tissues—only, however, to a very limited extent, not more than what is barely sufficient for the passage of the needle and ligature. The aneurism needle should have its point neither too sharp (to endanger wounding of the arterial coats) nor too blunt (to render tearing and force necessary for its passage). Armed with a firm, round ligature of silk or thread (well waxed, to facilitate application), it is gently insinuated beneath the artery at the detached point—great care being taken to exclude all textures, save the arterial, from within its circuit, more especially nerves and veins. Having passed, the ligature is laid hold of and retained, while the needle is withdrawn. The loop of the ligature is then cut and one-half pulled gently away. The remaining portion is secured on the vessel with a reef knot." (Miller, Principles of Surgery, p. 534).

After the application of the ligature, the tumor sensibly diminishes in size, pulsation and bruit, and favorable cases usually become consolidated in a few days. Fibrin is deposited within the aneurismal sac and from the sac to the point of ligation upon the artery, forming firm, concentric layers and ultimately occupying the whole channel of the

vessel. In the mean time, the limb below the point of
tion is nourished by the collateral circulation, which is
increased in amount and activity. Blood finds its way
to the aneurism, which again pulsates moderately for a
and this is necessary, lest a coagulum should form in th
and lead to suppuration or gangrene by its unnatural pres
The patient should be kept to his bed, protected from e
ment and gently relaxed by aromatic drinks. If the he
the limb should sink pretty low after the operation, it
nor be interfered with; if the establishment of a free
lateral circulation should raise the heat above the na
standard, no fears need be entertained and nothing be
quiet, cooling regimen and relaxants, is needed. The pe
extremity of the ligature should be removed at the p
time and the wound kept clean till it heals from the bo

The application of the ligature to an aneurism is not a
successful. It may fail for want of good plasma, as in
butic persons; or of support by firm structures aroun
sac, as in aneurism of the carotid. Gangrene of the sac
also ensue, being either provoked by the formation of co
or arising in consequence of debility and reactive capac
the circulatory system. The operation is most success
small tumors that have been of slow growth and ar
tinctly circumscribed. When the patient is hearty an
blood possessed of firm plastic material, cure seldom fa
be accomplished.

Both pressure and ligation may fail to cure an aneur
tumor, when amputation is the last resource of surgery.
procedure is demanded in all cases of threatening gang
whether resulting from sudden or excessive diffusion c
aneurism or following the impediment to nourishment o
by ligation. When a bone has become largely implicat
the return circulation impeded by disease of the vein, a
tation should be practiced early, as it is the only mo
averting gangrene—the occurrence of which demands a
tation under very unfavorable circumstances.

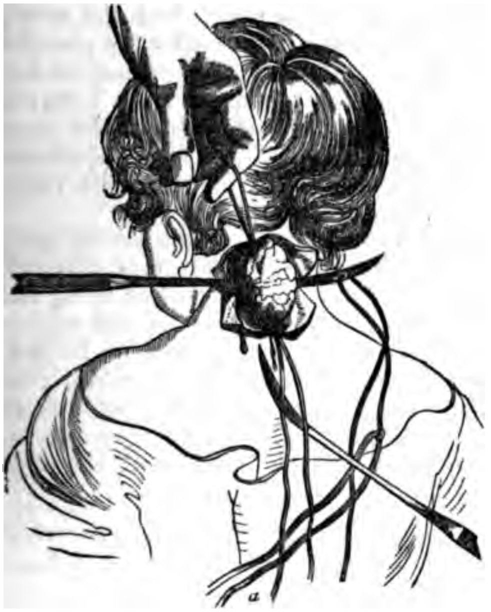
Aneurism by Anastomosis—Erectile Tumor.

The simplest form of aneurism by anastomosis is th
which the capillaries, either of the venous or arterial ci
tion, are permanently dilated, causing a discoloration c
skin, as is witnessed in *nævus* or "mother's mark."
anastomosing aneurism, however, consists of dilated an
osculating arterial ramifications, which freely commu

with one another and form an enlargement of a pulsating character, which has been termed an erectile tumor. These tumors are generally situated just under the skin, especially in the region of the head and neck; but they are also found under the mucous tissues, constituting hemorrhoids. The enlargement is usually congenital, but may be provoked by irritating pressure; the vessels enlarge slowly but regularly, reaching various sizes and forming tumors of various forms; the aneurisms pulsate as do true aneurisms, though less forcibly, and a dull bruit and vibratory thrill are heard. In the course of time, the skin may be excoriated and rupture of the vessels may lead to serious, if not fatal, hemorrhage.

Treatment.—Anastomosing tumors may be removed either by excision or ligation. Excision is only applicable to very small tumors, as dangerous hemorrhage may be provoked by incising the vessels. In applying the ligature, the skin is first to be dissected back and the tumor exposed. A ligature needle is then armed with a double thread and passed through the base of the tumor. The needle having been removed and the ligature severed, each half of the ligature is to be tied around the corresponding half of the tumor. The cord must be tied tightly, that the circulation may be stopped at once. When the tumor is of large size, two ligatures may be passed at right-angles through its base—the nooses, when tied, being each then made to embrace one-fourth of the whole morbid growth. As the tumor shrinks, the ligatures become loose, when they may be retightened till mortification of the tumor takes place. The wound is then to be dressed after the ordinary manner of wounds.

Fig. 60.



Removing Erectile Tumor by Rectangular Ligatures.

When the anastomosing aneurism is large and is diffused over the surface, deligation upon the main supplying artery may be practiced. Many times, the collateral circulation is so great that more than one artery will have to be ligated. In some instances, especially where the tumor is small and congenital, surgeons have pursued the plan of introducing vaccine virus under the skin. The mode in which this virus acts is unknown to us, but much success seems to have attended this practice. Where a small member, as a finger or toe, is almost entirely occupied by an anastomosing aneurism, it may be at once amputated.

Varicose Aneurism.

This is a variety of false aneurism in which both the artery and the vein are affected. It usually occurs after the practice of venesection, when the lancet has transfixed the artery underneath the opened vein. There is a communication between the two vessels, with dilatation of the vein and of the communicating channel—forming, as it were, two aneurisms. Fibrinous deposit takes place in the vein after the usual manner. Bruit and pulsation are unusually distinct.

The difficulty is treated by deligation of the artery upon its cardiac aspect. Another mode of procedure is adopted, which consists in incising the aneurism and then tying the artery both upon the cardiac and distal sides of the tumor. This operation requires much care, as the vein may be tied, being mistaken for the artery. The surgeon should not be too readily deceived by the aneurism upon the vein itself, but search more deeply (with great care) till he reaches arterial blood, when he may know that he has found the true vessel to operate on.

CHAPTER VIII.

AFFECTIONS OF THE VEINS.

Phlebitis.

The veins, particularly varicose veins in the lower extremities, are very liable to have an inflammatory action provoked in their coats upon even trifling occasions. The vessel swells and becomes hard, and a red streak upon the skin follows it as far as the phlebitis extends. The pulse is slightly quick-ened, and sharp pain (which is much increased upon pressure) is felt along the affected track. The coats of the vessel thicken and its caliber becomes narrowed in consequence of fibrinous exudations. The blood in the vein frequently coagulates and completely obliterates the vessel—which may ultimately wither and disappear by absorption, or remain closed for a time and be reopened by the absorption of its coagulum.

This degree of vital action is very tractable to rest, pills of lobelia, drinks of asclepias or eupatorium and irrigation with cool water, or poultices of elm and lobelia. It should be treated promptly and never be allowed to progress unheeded; for the same influences which have provoked a simple phlebitis, may, if allowed to continue, lead to congestion and suppuration, when serious consequences may ensue.

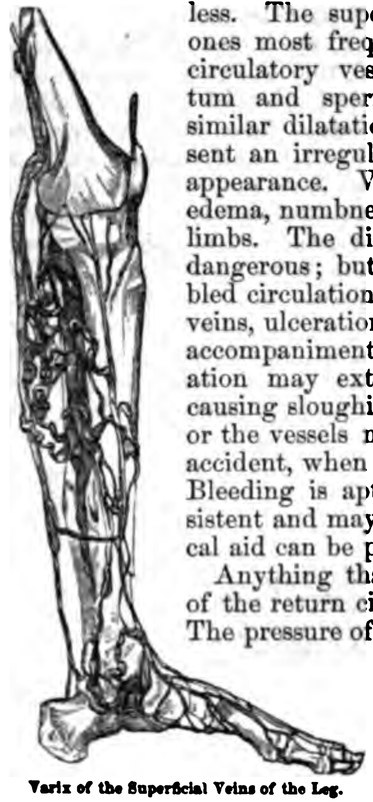
Suppuration of Veins.

Circumscribed Abscess.—Suppuration of the coats of veins is generally of traumatic origin. It usually commences upon the internal coats and is always preceded by phlebitis and fibrinous deposits, in the same manner that abscesses in other parts are preceded by inflammation and accompanied by fibroplastic exudations. The outer coats of the vessel thicken, the inner coats soften and the blood coagulates. The vein distends before the accumulation of pus, the accession of suppuration being marked (here as elsewhere) by rigors, febrile exacerbations and throbbing pain. The surface is swollen and red, and the abscess appears in the form of a fluctuating tumor. If the fibrinous walls and coagula hold firmly, the pus may remain circumscribed till ulceration makes a way of escape or the surgeon comes to the assistance of the patient. If the walls break down and the purulent material escapes into the circulation, all the symptoms of pyæmia will be apt to follow, and death is strongly probable. It is to avert such a fearful contingency that the practitioner should treat every phlebitis early and energetically. And when suppuration has commenced and a circumscribed abscess has been formed, the prompt evacuation of the pus is of vital importance.

These cases are to be treated on the same principles, and by the same means, that are appropriate to abscesses in other parts of the system (see pages 133–41). Poultices of lobelia and ulmus in all cases, the addition of zinziber or aristolochia when the purple hue of congestion is prominent, diffusively aromatic drinks to maintain the strength and favor an outward circulation, and the use of the bistoury as soon as pus is de-twenty-four hours till the acuteness of the symptoms abates. Use the vapor bath after each emetic, and give plenty of such drinks as zinziber, zinziber and mentha, polemonium, or asarum and asclepias, throughout the day. If typhoid symptoms manifest themselves, the treatment must be the same as that for other typhoid cases. If symptoms of pyæmia arise, the case must be managed according to the new necessities. Too much vigor cannot be exercised, and even this active medication may fail in a majority of cases.

Varix.

Fig. 61.



Varix of the Superficial Veins of the Leg.

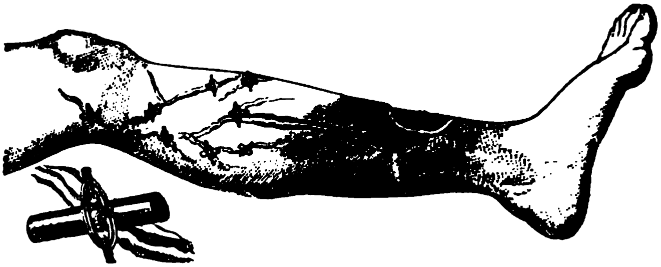
Varix, or a varicose condition of the veins, consists in dilatation of these vessels with thickening of their walls—the valves, at the same time, becoming useless. The superficial veins of the legs are the ones most frequently affected, but the return circulatory vessels of the arms, breast, rectum and spermatic cord, may suffer from similar dilatation. The varicosed vessels present an irregular, knotted, hard and tortuous appearance. Varix gives rise to more or less edema, numbness and stiffness of the affected limbs. The difficulty can not be said to be dangerous; but, in consequence of the enfeebled circulation in the parts below the varicose veins, ulceration of the skin is a very common accompaniment of this condition. This ulceration may extend to the veins themselves, causing sloughing and leading to hemorrhage; or the vessels may be ruptured by any slight accident, when hemorrhage will again follow. Bleeding is apt to be very copious and persistent and may terminate fatally before surgical aid can be procured.

Anything that interferes with the freedom of the return circulation may lead to varices. The pressure of tumors, also the pressure of the fetus in utero during pregnancy, the steady maintenance of an erect posture (as is necessary in some trades) and general feebleness of the system, are the most frequent favoring causes. Tall persons are more liable to it than short ones; and long veins, as the saphena, suffer oftenest—the gravity of the column of blood they contain enfeebling their circulation.

Treatment.—The treatment may be either palliative or curative. The palliative treatment is by all means to be undertaken first, and the radical or curative attempted only when necessity forces the surgeon to this alternative. The patient should be kept in a recumbent posture as much as possible; the bowels should be regularly unloaded either by enemas or physic, morbific materials removed from the system by alteratives and the vapor bath and the general strength maintained by tonics. If gestation is the cause, the period of labor should be waited for patiently. The return circulation may be directly sustained by the aid of gentle compression. Stockings made of elastic materials may be worn upon the lower extremities, the pressure being made to bear uniformly and lightly on all parts of the limbs.

In attempting a radical cure, the object is to provoke inflammatory action in the vessel, that fibrinous organizations may be formed and the channel of circulation thereby obliterated. Various modes of procedure have been adopted to accomplish this end, among which may be mentioned excision of the vein and ligation. Both of these operations are highly dangerous and should never be undertaken. The caustic known as *Vienna paste* (which is composed of quick lime and potassa) has been applied to the veins at different points, with the design of causing an eschar and provoking inflammation. The only proper procedure, however, consists in the application of the twisted suture. Beginning at the upper part of the varicose vein, the vessel is to be carefully lifted up with the integument and a curved needle passed under it. The vein must not, on any account, be injured or transfixed by the needle. A small piece of a flexible bougie may be then laid over the vein at right-angles with the needle, and a moderately broad and soft ligature twisted about the points of

Fig. 62.



Operation for the Radical Cure of Varix.

the needle and over the bougie. The pressure of this ligature should not be very tight, as congestion may be thereby caused and gangrene provoked. The needle, with its ligature, should be allowed to remain for eight or ten days, or till they have sloughed away. A moderate degree of inflammatory action is always provoked by this procedure. This is the object of the operation, and no fears need be entertained so long as the purple hue of congestion is not observed. If the general feebleness of the circulation, or the tightness of the ligature, lead to congestion, the needles must be at once removed.

Before proceeding to this operation, the system should be well prepared by baths, physic and tonics. The patient should maintain the recumbent posture during the time that the pins remain inserted. If erysipelas is provoked, or suppuration or gangrene threatened, the pins must be removed and the most active course of treatment at once adopted. The great danger connected with erysipelas and suppuration of the veins, at once shows the necessity of unstinting thoroughness in medication. In order to prevent the varicose condition from being maintained by the anastomosing circulation, a number of pins should be introduced along the veins at distances varying from three-fourths of an inch to an inch. Even after the circulation has been once obliterated, it is liable to be re-established by absorption of the organizations. On this account, the patient should be kept perfectly quiet for two or three weeks, or till the organizations have become firm, and even then he should only be allowed to resume his duties gradually; otherwise the other veins of the part may become dilated in consequence of the extra labor that has been thrown upon them, and new varices formed.

Entrance of Air into Veins.

The entrance of air into veins is a rare, but very alarming, accident. It occurs only upon severance of the larger veins, more particularly those situated about the neck, thorax and axilla. It can only take place when the severed vein is in a gaping condition, a condition which may be caused either by canalization consequent upon an hypertrophied state of the vessel, or by tension of the vessel at the moment of its severance. The air enters during the act of inspiration, and transverse incisions are more dangerous than oblique ones. It is only recently that this accident has been noticed and investigated. Mr. Erichsen has made numerous experiments upon animals, of which he gives the following experience (Surgery, p. 141): "On exposing the internal jugular vein low in the neck, and puncturing it at a place where the flux and reflux of the blood are plainly discernable, there is perceived, in the first inspiratory effort made by the animal after the wound, a peculiar lapping or gurgling hissing sound; the nature of the sound depending partly on the size and the situation of the opening in the vessel. At the same time, a few bubbles of air are seen to be mixed with blood at the orifice in the vein. The entrance of the air is immediately followed by a struggle during the deeper inspirations, in which fresh quantities gain admittance, the entrance of each portion being attended by the peculiar sound above described. On listening now to the action of the heart, a loud churning noise will be heard, synchronous with the ventricular systole, and the hand will, if applied to the parietes of the chest, perceive at the same time a peculiar bubbling, thrilling or rasping sensation, occasioned by the air and blood being, as it were, whipped together between the columnæ carneæ and chordæ tendineæ. As the introduction of air continues, the circulation becomes gradually more feeble and languid; the heart's action, however, being fully as forcible, if not more so, than natural. The animal soon becomes unable to stand; if placed upon its feet, rolls over on one side, utters a few plaintive cries, is convulsed, extrudes the fæces and urine and dies. If the thorax be immediately opened, it will be seen that the heart's action is continuing regularly and forcibly, and that the pulmonic cavities, though filled, do not appear distended beyond their ordinary size."

The effects of the introduction of air into veins are in all respects the same in man that they are in the beast; the patient faints, may scream out and die immediately, or he may die as if from general syncope. If the quantity of air that has entered is small, death may not take place at once; the action of the heart, however, becomes at once labored, respiration is hurried, convulsions are provoked and breathing soon ceases. The heart continues to beat after death has actually taken place.

Treatment.—The management of this difficulty should consist mainly in the avoidance of its occurrence. When the surgeon is operating in the neighborhood of large vessels, especially about the dangerous regions above mentioned, care should be taken not to sever the vein at the moment when inspiration is about to be performed; and an assistant should always stand ready to seize the orifice of the cut vessel at the moment the knife is applied to it. The vessel also should be left lax and not put upon the stretch by forcing the head or arm into an unnatural position. When air has actually entered, the first thing to be done is to prevent the access of more. For this purpose, an assistant should put his thumb firmly upon the orifice of the vessel, the patient should be placed in a recumbent position, the femoral and axillary arteries compressed, in order to keep the blood in full circulation at the vital centers, and artificial respiration then performed. It seems probable that, if the patient is thus duly assisted, the air may be cast out from the blood through the cells of the lungs, when the patient may be safely pronounced out of danger, except that he is liable to pulmonary congestions. These are to be managed according to the ordinary process of treating pneumonia.

CHAPTER IX.

AFFECTIONS AND INJURIES OF THE SCALP AND CRANIUM.

Wounds of the Scalp.

ALL wounds of the scalp, however simple they may be, are of a serious character, their proximity to the great nervo-vital center rendering serious consequences possible. Erysipelas of the integuments may be provoked by the violence which produces the injury, the periosteum may be separated from the bone, suppuration underneath the integuments is always probable and caries or necrosis may possibly be produced. Where the violence is not great enough to cause an actual wound, but a simple bruise or contusion only, ecchymosis is likely to be considerable and bloody tumors are generally formed under the scalp. Sloughing of the scalp is by no means uncommon under such circumstances.

In all injuries of this character, the wound must be first washed, all foreign solids removed, the hair cut off closely to the skin and the parts carefully readjusted. If arteries have been lacerated and hemorrhage is considerable, the surgeon must unhesitatingly use the knife to enlarge the original wound and proceed to ligate the bleeding vessels. If the periosteum has been scraped up from the bone, the accident becomes very grave in consequence of the contingency of necrosis; yet no portion of the osseous covering must be cut away, but every shred (both of the periosteum and the skin) must be snugly replaced upon the cranium. If the wound is considerable, it is well to shave the larger portion of the head, after which the lips of the wound may be held in position by adhesive straps and a handkerchief, or four-tailed bandage, about the whole head. Sutures must not be employed under any circumstances when it is possible to avoid them, and any pus that accumulates underneath the scalp must be allowed the freest possible exit. Simple wounds may heal readily by the first intention, but reunion by granulation is more common in all degrees of these accidents. When the scalp has been lifted from the skull for a considerable distance, the process of reparation is slow and tedious and neither the periosteum nor integuments adhere firmly to the bone till after the lapse of a considerable space of time. Ultimately, however, reunion is effected.

If erysipelas occurs in consequence of the violence producing the injury, it must be managed upon the principles already directed for erysipelas in general. The course of medication must be pursued with the utmost vigor; for not only is there a strong probability of gangrene of the scalp, but there may be a metastasis of the erysipelas to the brain itself—an event fraught with the utmost seriousness. Sometimes the brain is injured by the same violence that causes the wound, the management of which class of accidents will be reserved for the next section.

Concussion of the Brain.

Concussion, or jarring, of the brain may be caused either by direct violence upon the skull, or indirect commotion transmitted through falls upon the feet and other parts of the body. The shock of the violence produces disturbance in the substance of the brain itself, also disarranging the current of its circulation and interfering with its sensory and motor functions. When the injury is but slight, the patient presents the appearances peculiar to all shocks (p. 285), becoming pale, cold, motionless and insensible. Very severe violence causes decided stupor and temporary paralysis of the whole system, with sighing respiration and a feeble and unsteady pulse. After a time, varying from one to several hours, the immediate effects of the shock pass away, when the patient breathes more hurriedly, the pulse becomes more rapid, loud questioning obtains monosyllabic answers, the heat gradually returns to the surface, vomiting usually supervenes and reaction is then speedily restored. At first, there may be retention of the feces and urine to such an extent as to require the use of the syringe and catheter; afterward, in very severe cases, the urine and excrement may be passed involuntarily. Lesion of the brain, and consequent extravasation of blood, may be caused by great violences, leading to early death without reaction. In some cases, the immediate concussion may cause stupor, and the extravasation of blood within the cranium may continue that stupor (or partial insensibility) for an indefinite period. In more rare instances, the effects of the shock may partially or wholly pass away and then be followed by the gradual accession of deep insensibility, with heavy breathing, cold surface and feeble pulse. These cases are the result of pressure caused by slowly extravasated blood. They will be more particularly discussed in the section upon Compression of the Brain.

TREAMENT.—Says Prof. Miller (Practice of Surgery, p. 88): "In the first stage, that of depression, if we act at all it will be with the view of favoring at least the commencement of reaction. An opposite procedure were plainly at variance with common sense; but, unfortunately, it is found to be not equally at variance with common practice. A man stunned by a blow or fall, and laboring under simple concussion, is often bled on the instant—or an attempt, at least, is made to bleed him—by the rash and thoughtless practitioner. In other words, a fresh and powerful agent of depression is exerted on the general circulation, when such depression is already great and has probably brought life to the very verge of extinction. If blood flow from the wound in venesection, under such circumstances, perhaps life is lost; at all events, the direct untoward result of the injury is aggravated and the case is rendered both more urgent and more protracted than it otherwise could have been." These remarks, coming from a writer of such undisputed authority in Allopathy, should certainly be sufficient to check that popular clamor for the practice of venesection, in concussion, which is so general in this country.

During the period of somnolency, diluted third preparation of lobelia may be given in small doses, every few minutes, till reaction begins to set in. Infusion of aristolochia, zinziber and capsicum, asarum and xanthoxylum and similar diffusively stimulating articles, may also be given. All these agents should be used in moderate quantities and their exhibition stopped as soon as signs of reaction appear; and they may be aided by heat and gentle friction at the extremities and an enema composed of lobelia and zinziber in ulmus water. When consciousness returns and the pulse becomes rapid, the patient should be kept in a quiet room (undisturbed by visitors, noise and conversation) and treated with mentha, asarum, lobelia or boneset, according to the degree and quality of the tension present. If the bowels are costive, unload them by enemas and doses of leptandra—check them by enemas of geranium or hamamelis when too loose; empty the bladder by the catheter when required; treat wakefulness and traumatic convulsions with lobelia in quantities to suit the case; and manage any untoward symptoms that arise, according to their nature and the character of the conditions of which they are severally indicative.

Traumatic Encephalitis.

Inflammatory excitement may be provoked in the brain by any violence upon the cranium, particularly upon the frontal bone and temporal ridges. Cerebral excitement, delirium, intense pain in the head and great heat upon the scalp, are the more prominent evidences of the vital struggle. The carotids pulsate with unusual force, the eyes and ears are inordinately sensitive, the patient is generally wakeful and all the manifestations of ardent inflammatory fever are present. If this labored action is not relieved, extensive congestion usually takes place, leading to all the symptoms of compression; and death by coma may result in a short time, being preceded by lethargy, clammy skin, convulsive twitchings and deep somnolency. Or suppuration of the cerebral substance may take place, the vital power proving insufficient to overcome the immediate effects of the injury. Death is then also inevitable. The fluid of decomposition may be gathered in the form of an abscess, or float loosely upon the brain and through the ventricles.

Intense inflammatory action does not arise in all cases of injury, but a low chronic arterial excitement may be provoked instead. Or the ardent excitement may have existed and then be followed by the chronic degree of inflammation. The head is constantly painful, the patient is uneasy, restless and, usually, peevish; mental vigor is more or less impaired, the irregularity of mind varying from a trifling loss of memory to an imbecile childishness. There is a tendency to wakefulness, an undue sensitiveness of sight and hearing, a proclivity to convulsive twitching, and death may be preceded by epileptic manifestations and coma. The arachnoid membrane is most frequently affected in these cases, and abscesses are likely to form upon the surface of the brain, giving rise to more or less marked symptoms of compression.

The abdominal and thoracic viscera very commonly suffer during traumatic encephalitis, the lungs being frequently afflicted with congestion and the liver by abscesses. These difficulties more particularly belong to the department of medical practice.

TREATMENT.—When the inflammatory excitement is ardent, the tissues are to be relaxed and the blood invited from the brain to the extremities. Put the patient upon drinks of asclepias and eupatorium, or asclepias and lobelia; give enemas of ulmus and lobelia, in powder, every second or third hour and have them retained as long as possible; administer vapor baths to the lower part of the body, never allowing the steam to reach any point higher than the axillæ; keep the patient very quiet and in a room darkened to a twilight; apply warm irons to his feet and legs and bathe the extremities with stimulants and the head with tepid water; unload the bowels by enemas and leptandra, when necessary, and let the food be light and of a liquid form. Very large quantities of lobelia will be required to secure the proper amount of relaxation. The vapor bath is always to be applied while the patient lies in bed; or it may be replaced by the blanket pack wrung out of hot lobelia water. Ice and very cold water should not be put to the head, but the main dependence should be placed upon the relaxants and baths, which *invite* the blood from the brain many times more effectually than it can be *driven* from it by the local application of cold.

When the inflammation is sub-acute, the patient must be kept very quiet and free from all conversational or other excitement. The blood must be steadily invited downward by warm applications, and moderately stimulating embrocations, to the feet, legs and arms; the head is to be kept cool; cerebral tension relieved by the frequent use of lobelia sirup or pills and drinks of asclepias and asarum, mentha and eupatorium and macrotrys; and the bowels regularly unloaded by enemas and mild physic. Many weeks and months are frequently required for the entire restoration of a patient who has suffered in this way; and the practitioner must exercise all his care and skill without becoming listless or indifferent to the welfare of his patient. Even after the brain seems to have been entirely relieved, the utmost quiet and watchfulness must be enjoined, otherwise a permanent irritability may ensue and the sufferer's mind be impaired for life. The diffusively relaxing nervines are to be used regularly and lobelia is not to be omitted so long as any cerebral excitement and tension remain. The practitioner should not, on any account, be tempted into the use of opiates to relieve the constant irritability. All narcotics are unfit to enter into the human system, and the innoxuous lobelia, scutellaria, asarum and macrotrys (in very small quantities), will do all that it is possible to accomplish by the aid of medication.

Abscess of the Brain—Purulent Accumulations.

Inflammation of the brain may, in one sense of the word, be pronounced dangerous—not because it is in any-wise calculated to produce organic lesion, but from the fact that the excessive pressure of blood within the unyielding cranium may produce fatal compression. The chief danger to be apprehended, however, is that of suppuration—the life power not proving able to overcome the shock of the original injury and allowing the structures to pass under the control of the chemical laws (see the chapters on *Inflammation* and *Suppuration*, Parts I and II). The accession of suppuration is of vital moment, as death is then almost inevitable; hence the urgent necessity of aiding the life power, by every means that can be brought to bear, from the first accession of encephalitis.

The formation of pus can not be detected with any degree of positiveness. The only symptoms that can be said to be reliable are those which usually pertain to the accession of suppuration: namely, systemic rigors during the continuance of the inflammatory excitement. There is also coma gradually succeeding to the rigors, with cessation of suppuration in the scalp wound and elevation of the pericranium from the bone. The point at which the pus forms is an unanswerable question, though it is most likely to take place immediately under the wound. The symptoms of compression gradually become more manifest and the patient dies in a comatose condition. No treatment is applicable, except the use of the trephine, as will be detailed in the next section.

Compression of the Brain.

Compression of the substance of the brain may be caused by fracture of the skull, one piece of the tablet, or a spicula of the bone, being forced inward; by bony tumors growing upon the inside of the cranium, as exostoses, osteo-cephaloma and osteo-sarcoma; by the presence of extravasated blood, or of pus. Liquid effusions may also take place in the ventricles of the brain, or upon its surface, and excessive congestion may produce actual compression. The advance of compression may be classed into acute and chronic forms, the former being generally caused by sudden extravasation, effusion or the formation of pus; the latter being most frequently produced by morbid growths within the osseous tablets.

The chief symptom of compression is that of coma, which usually advances steadily till the organ is so far injured as to lead to death. As the pressure is usually limited to one portion of the head, so the coma may be perceptible upon a single organ or class of organs—all the mental faculties performed by the unpressed organs remaining comparatively unimpaired. This, however, is not always the case, general stupor frequently supervening upon pressure over a small space. The patient lies in a lethargic and unconscious condition, appears partially paralyzed, breathes heavily and with a blowing of the lips during expiration, and voids the feces involuntarily. The pupils are dilated, the eyelids usually closed and the skin is commonly cool. This condition may continue for an indefinite length of time—death resulting in a few hours in some cases and not occurring for several months in others. Where the pressure is sufficient to cut off circulation, decay of the cerebral structure soon commences and life does not last long. Paroxysms of delirium, and even of convulsions, sometimes precede death.

TREATMENT.—No relief can be obtained till the compressing cause is removed. When the case is one of fracture, the elevator and trephine can be usually depended upon to restore the freedom of the parts and effect a cure. When abscess or extravasation of blood is suspected (compression following an injury), the surgeon labors under the disadvantage of not knowing precisely the point of the pressure, nor its situation as to whether it is between the membranes, in the ventricles or among the convolutions. The trephine, therefore, should never be used in these cases unless as a last resort and after it has become evident that no hope of life is left. It may be then used as has been directed in the chapter on *Fractures*. If the extravasated blood or pus is liquid, it will at once escape upon the removal of the piece of bone; if it is clotted, it may be taken away by gentle manipulation with a flexible probe.

Hernia Cerebri.

Hernia, or protrusion, of the cerebral substance may occur whenever there is deficiency in the cranial covering, as, after wounds of the skull and trephining of the bone. The brain bulges out through the opening, forming a tumor upo surface of the cranium. The tumor becomes strangulat the pressure of the bony rim and parts of it slough speedily leading to a fatal issue. Treatment consists m in prevention by applying timely compression over the fi in the bone, and by quieting the system with the free u relaxants. After the hernia has been formed, relaxation be pushed steadily and continued (but mild) pressure m practiced upon the protruded mass. If this fails an tumor seems about to slough, no alternative remains b shave it off evenly with the skull. This operation is a tremely hazardous one, but sometimes succeeds in savin patient's life.

Paracentesis Capitis.

Hydrocephalus may be sometimes relieved by tap especially when the fluid has accumulated just withi dura mater or above the substance of the brain. Whe effusion has taken place in the ventricles, paracentesis c no good, but will surely provoke mischief. In perfor this operation, a trocar and canula of the smallest size s be selected and the instrument carefully introduced th the gaping coronal suture, at a proper distance fro longitudinal sinus. The fluid should be allowed to e very slowly through the canula, and pressure upon the should be made by the hands of an assistant. Quiet an laxing treatment are to be directed for several days aft operation.

CHAPTER X.

AFFECTIONS OF THE ORBIT AND ITS CONTENTS.

Affections of the Orbit.

Wounds.—The proximity of the brain to the orbit a gives a serious aspect to injuries of this cavity, as the trating solid may pass through the orbital plate and the cerebral substance. Inflammatory action will alwa provoked and suppuration is by no means unlikely to and immediate death may be caused by extravasation the skull. In treating these accidents, any foreign solid may have lodged in the parts must be removed as ea possible, but with great carefulness. The external may require to be dilated in order to effect the extraction of spiculæ of bone or the elevation of the orbital plate when it has been pressed inward. This having been done, the patient should be laid upon his face till the bleeding ceases and cold water dressings afterward applied over the wound. If cerebral and arterial excitement follow, they are to be relieved by suitably relaxant drinks and enemas.

Tumors.—Exostoses, principally the ivory exostosis, occasionally grow upon the obital plate; but they cause little inconvenience unless they are of the cancellated variety, when they may be cut down upon and removed by the bone-pliers. Sarcomatous growths are frequently met with in this region, and simple growths are quite common. In the malignant enlargements, early and complete excision is the only hope left to the patient. Simple tumors need not be interfered with unless they attain an inconvenient size, when they may be excised.

Affections of the Eyelids.

Ecchymosis.—This is a very common occurrence of blows and other violences, the eye being pronounced "black and blue." It seldom leads to any greater inconvenience than its unsightliness, though the injury that caused it may have also damaged the eyeball and provoked pain and inflammation. It is best treated by cold water compresses, but may be also managed by poultices of convallaria and milk and by the application of moistened sassafras pith. *Wounds* of the eyelids may be managed the same way.

Foreign Bodies.—The lodgment of dust, sand, cinders and other solids in the eye, is among the small but painful accidents of life, provoking much irritation and a profusion of tears. They may be easily removed by lifting the eyelid gently outward and then directing the patient to roll the eyeball around in various ways. This generally brings the object to view, when it can be drawn away by the bulb of a flexible probe or the corner of a silk handkerchief. Cold irrigation will readily remove fine particles of dust.

Opthalmia Tarsi.—The edges of the eyelids, including the Meibomian follicles, are occasionally troubled with the lodgment of systemic impurities that provoke inflammatory action in the parts, causing redness, itching heat and even the loss of the cilia. The eye is intolerant to light and looks as if surrounded by red areolæ. Persons of a strumous diathesis are most frequently troubled thus, the affection getting the name of *Lippitudo* when the eyelashes are lost. The tarsi can be restored to a healthy condition only by purifying and strengthening the whole system. This is to be done by the use of alterants, vapor baths, a vegetable diet and general and local cleanliness. The difficulty causes an unpleasant and bleared appearance, and is tedious to eradicate.

Tumors.—Small and delicate encysted tumors may occur at any part of the eyelids, either under the conjunctivæ or the skin. They are thin and pellucid, containing a whitish fluid, and are readily emptied by puncture. A little mild caustic may be applied to them, after they have been emptied, to secure their permanent removal.

The eyelids also suffer from carcinoma, which is generally of the scirrhous form, bearing the appearance of warty growths. The integument ulcerates early and the sore may spread rapidly, not only involving the whole lid, but the eyeball also. The malignant growth is to be immediately removed by excision, which should be sufficiently wide and free to embrace the whole carcinomatous mass. Sometimes this will include the entire lid, the ball of the eye being left bare. If the ball becomes diseased in consequence of this exposure, it may be collapsed by puncturing the cornea and allowing the exit of the humors; or it may be entirely excised. Thorough constitutional treatment should precede and follow all operations for malignant growths here as well as elsewhere.

The eyelids occasionally suffer from hypertrophy, becoming thick and deformed, provoking an irritating discharge and interfering with the sight. The upper lid is most frequently affected. The unpleasant sequences of the enlargement may be removed by taking away a piece of the hypertrophied parts by two elliptical incisions. The incisions should be parallel with the length of the lid, extend quite through the conjunctiva, and the edges are to be brought together and retained by sutures and adhesive plaster.

Anchyloblepharon.—This term is applied to the adhesion of the tarsal edges of the eyelids, which may result during cicatrization after burns and scalds, or it may be congenital. Usually, the edges are joined only at their angles; but the whole margins sometimes cohere, entirely closing in the ball and precluding vision. The difficulty is treated by incising the united edges. If the union is complete, a fold of the integument should be raised upward with a pair of forceps and a small horizontal incision made through it at some convenient point. A director is then to be introduced through this aperture and the incisions completed to the angles of the lids. After the parts have been separated, much care should be taken to prevent their reunion, and cold water compresses may be applied to the eye to relieve the inflammatory excitement that will be provoked. Dressings may be interposed between the severed edges and the lids may be frequently lifted from one another by the fingers; but if these means do not prove sufficient to prevent reunion, a wash of tannin may be smeared along the edges and the lids forcibly held apart by strips of adhesive plaster.

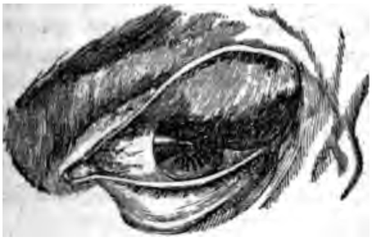
Symblepharon.—In this affection, the eyelids and eyeball adhere together by a more or less dense fibrinous growth between them—the deformity usually resulting from cicatrization after injuries. When the cicatrix is hard and extensive, but little or nothing can be done toward relieving the patient. When the union is but slight and the textures soft, entire relief may be obtained. The simplest mode of operation consists in gently lifting the lids upward by a pair of forceps and then very carefully dissecting through the cicatrices. Re-adhesion is strongly probable after this operation and sometimes it is quite impossible to prevent its taking place. The most promising means of prevention consist in frequent motion of the eye and occasional separation of the parts by the introduction of a flexible probe.

Ptosis.—This consists in a superabundance of integument, with paralysis of the elevating muscles of the lid (the upper eyelid only being affected), which allows the cover to fall downward over the eye and obstruct vision. Ptosis occasionally arises through paralysis during disease of the brain, when it will require no treatment. When the difficulty is original, or congenital, it may be readily overcome by removing an elliptical portion of the redundant integuments—the incised edges being brought together either by suture or plaster. The tendency to paralysis is generally removed by washing the parts with an infusion of capsicum and myrrh and the passage of a current of electricity through them.

Trichiasis and Distichiasis.—By trichiasis is understood the inversion of the tarsi of the lid, by which the lashes are brought against the globe, provoking painful irritation. The difficulty may be slight, referring to only a few hairs in one lid, or it may occupy the entire cilia of both lids. The consequences to vision are sometimes serious. The first attempts at treatment may consist in turning the cilia outward frequently and relieving the inflammatory excitement that has been provoked by the application of cold water compresses. It is not often that this management will succeed, and the practitioner is usually forced to entirely remove the lashes. This may be done either by pulling the cilia out by the roots, or then to be brought together and cold water applied till the bleeding ceases; and the parts are to be kept in position by strips of adhesive plaster, or by very fine sutures. The patient must then be kept quiet, inflammatory excitement relieved by cold water compresses and the parts frequently cleansed by suitable irrigation.

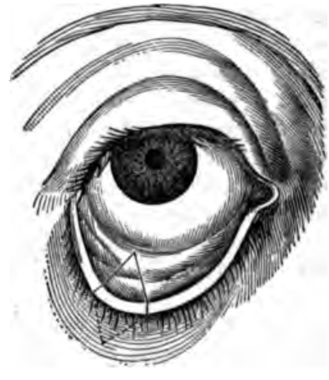
Ectropion.—This is directly the opposite of entropion, the lid of the eye being strongly everted and the conjunctiva exposed. At first this difficulty causes no unpleasant symptoms, but the mucous surfaces soon become irritated and may ultimately puff out in the form of a soft fungus, which sometimes increases to a size sufficient to preclude vision. This difficulty may be caused either by contraction during cicatrization of the integuments; or, as in the case of the lower lid, it may be produced by relaxation of the parts and even by redundancy of integument. The lower lid is most frequently affected. The treatment is to be in all cases operative. The irritability and swelling of the parts having been first relieved by cold applications, the redundancy of the conjunctiva may be removed by elliptical incisions. Care is to be taken, in making these incisions, not to remove too much of the membrane lest entropion should be produced. After the operation, the lid is to be brought to its proper position, when the edges of the wound usually heal without any further difficulty, cleanliness and the application of cold compresses being alone required. In those cases where the difficulty depends on the paralysis of the orbicularis muscle, the stimulating measures usually employed for other cases of paralysis may be directed. Sometimes the lid is very greatly elongated, the integument, as well as the conjunctiva, being at fault. Under such circumstances, a triangular piece is to be removed from the lid, as is figured in the accompanying cut. No distinct rules can

FIG. 63.



Ectropion of Upper Lid.

FIG. 64.



Operation for Ectropion caused by Elongated Lid.

be given for any of these operations, as cases of ect differ so materially in their form and aspects, that th geon will have to depend upon his own judgment as particular extent and form of the incisions required in vidual cases.

Affections of the Lachrymal Apparatus.

Epiphora.—This term implies an excess of lachrymal tion, by which the eye is continually filled, so much s the tears frequently overflow the lid and run down upc cheek. It should be distinguished from the deficient tion of tears peculiar in lachrymal fistula. In epipho eye is irritated and the secretion slightly acrid—the dif being usually connected with the scrofulous diathesi dependent upon an impure state of the system. It sho treated constitutionally, the system being invigorat baths and alteratives. The eye itself may be washed infusion of geranium, quercus or other astringent.

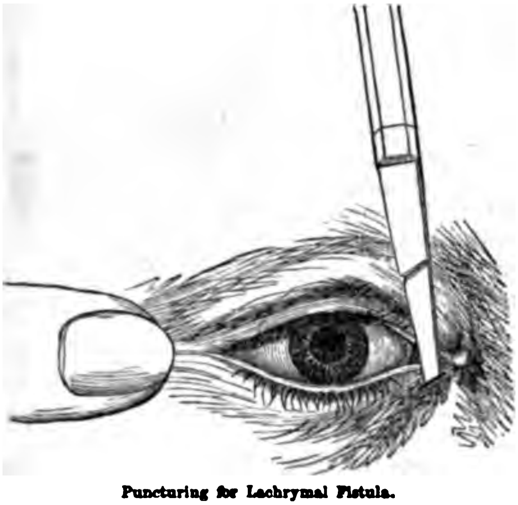
Suppuration of the Lachrymal Sac.—The lachrymal sa puncta lachrymalis frequently suffer in consequence of sure to cold, the capillary circulation of the parts bec obstructed, congestion being provoked and inflamm resistance established. The parts swell considerably an come red and painful. The patient suffers much by ache and the system is usually affected at the same general febrile effort being established and the skin becc dry and hot. The local excitement can generally be rel by cold compresses, or by poultices of elm and lobelia sassafras pith. When the system at large is much af by the same influence that brought about the local co tion, it must be relieved by drinks of the relaxant sudo by vapor baths, and gentle aperients to the bowels. I local difficulty is not relieved, suppuration usually e within a few days, pus accumulating below the tendon o orbicularis muscle, where it forms a small, hard ab which usually bursts and discharges externally. Afte discharge of the pus, the sore may granulate and hea properly. Very frequently, however, the lachrymal s occluded by the granulations, leading to lachrymal fistu will be presently noticed.

Chronic congestion and corresponding inflammatory r ance are sometimes provoked in those parts, either follo an acute suppuration or resulting in consequence of the tinued influence of cold or of the lodgment of dust in puncta lachrymalis. There is an indolent swelling with arterial excitement, the parts being slightly tender and the lachrymal sac filling with purulent material, which the patient can push out by his thumb and finger at pleasure. These cases are treated by attention to the general health and the local application of relaxants and stimulants combined.

Lachrymal Fistula.—When suppuration of the lachrymal sac has been followed by occluding granulations in the passage, the purulent material finds its way outward, leading to a fistulous opening from the sac to the inner angle of the eye. Or the nasal duct may become closed by the thickening of its membrane refusing to allow the passage of tears, which then accumulate in the eye, flow over the cheek, excoriate the lachrymal sac and lead to suppuration and fistula. Mercurio-syphilitic affections of the bone and periosteum may give rise to the same chain of consequences. The fistula gives an unsightly appearance to the face, being usually studded with fungous points and causing the tears to flow down the cheek continually.

These fistulæ occasionally yield to appropriate medication, though it is seldom that the patient can escape an operation. The main object is to re-open the nasal passage, that the tears may find their natural channel of escape. This can be sometimes accomplished by the gentle introduction of a flexible probe, the parts having been previously softened by the external application of a strong ointment of lobelia. Making strong inspirations through the nostril of the affected side aids the same object. If the duct can be thus opened, a few drops of any astringent infusion may be placed in the angle of the eye frequently—when they will be likely to pass down through the channel and constringe its mucous folds. If a syphilitic taint lies at the foundation of the difficulty, it should be met by the appropriate constitutional medication. When these means fail, the surgeon

FIG. 65.



Puncturing for Lachrymal Fistula.

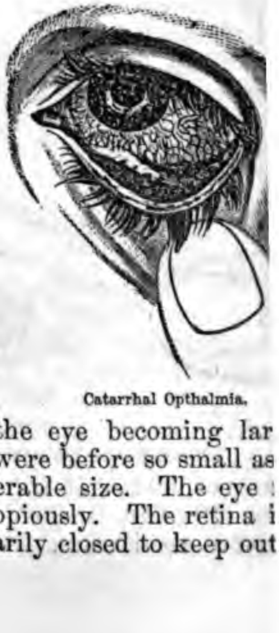
must puncture the sac by introducing a sharp-pointed toury below the tendo oculi and into the fistulous ope The point of the knife is to be pushed downward, back and slightly inward (as represented in the cut), till the age of mucus and tears into the nose indicates that th and duct have been opened. A flexible probe may be passed down the channel, which is to be kept perman open by wearing a small silver, gold or flexible style. size of the style should, at first, be quite small; the inflar tory action provoked by its presence should be quiete cold applications, poultices and relaxing drinks, the styl self remaining untouched; afterward the size of the in ment should be gradually increased till it fills the c cavity of the canal. It may be worn constantly, bein moved occasionally to cleanse the passage; or the surfa the duct may ultimately become firmly healed, when the may be removed altogether.

Affections of the Eyeball and Conjunctiva.

Opthalmia.—All the coats of the eye, as well as the junctiva, are strongly liable to opthalmia, which may be voked by the most endless variety of circumstances. presence of dust, sand, cinders, or any other foreign will give rise to what is known as *common opthalmia*, which is noticed by a smarting heat in the eye, with dryness of the surface and a pricking sensation at one particular spot. The blood vessels soon become gorged and the external coat of the eye, as well as the conjunctiva, presents a bright scarlet redness. In a short time, tears are excited and the eye is always intolerant of light.

Catarrhal Opthalmia.—Catarrhal opthalmia, or simple conjunctivitis, is usually provoked by the influences of cold and dampness, the whole vascular network of the eye becoming lar gorged with blood and vessels that were before so small as to be noticed being now of considerable size. The eye hot and dry and the tears flow copiously. The retina i sensitive that the lids are involuntarily closed to keep out

FIG. 66.



Catarrhal Opthalmia.

light. In a short time, varying from a few hours to a few days, the discharge becomes mucous or muco-purulent, is generally thin, but sometimes becomes quite thick, and is undoubtedly contagious. The eye can not be said to be in a state of pure inflammation under these circumstances, but there is an engorgement of blood and congestion, giving a strong tendency to suppuration of the free surface of the mucous membrane. The whole system is sometimes sympathetically irritated. Cold alone does not provoke simple conjunctivitis, but the same engorgements of the parts may be noticed during and after a fit of measles or the small-pox. It may also be provoked by exposure to the sun, dust, fumes of chemical irritants, etc.

Purulent Opthalmia can not be pronounced as anything more than an aggravated catarrhal opthalmia, the discharge presenting more decided appearances of suppuration. It most commonly affects children a few days after birth, but adults are by no means free from it. It usually begins with a redness of the lids and a gummy feeling between them and the eyeballs. The retina is still tender and the eyelids are involuntarily closed. An itching sensation is felt throughout the whole conjunctiva and the patient is strongly disposed to rub the eye, as if something were in it. The eyeball, as well as the mucous lining of the lids, becomes strongly engorged with blood. The pain shortly shoots through the whole orbit and even through the head, not unfrequently extending to the face. The purulent discharge now becomes profuse, the eyelids are generally edematous and the cilia and edges of the lids seem glued together by the thickness of the discharge. The patient is restless and slight febrile effort is not uncommon. By the slow progress of the chemical destruction on the surface of the conjunctiva, the membrane may be entirely denuded, when granulations will be thrown out, presenting the ordinary appearance of a granular sore.

The purulent form of opthalmia has long been extremely troublesome to the Eastern nations, usually beginning in adults by marked febrile action and often prevailing as an epidemic. Egypt, particularly, seems to be subject to this affection, which is there so common as to seem almost national. The affection in that country usually puts on its most intense and loathsome forms, the conjunctivæ and integuments becoming intensely hard and swollen, the discharge being profuse, thick and fetid and the patient presenting the most bleared and helpless appearance. This state of the lids is called *chemosis.* The destruction of the conjunctiva may be so great as to constitute actual ulceration. The cornea is frequently involved in the destruction and the sight may be wholly lost. The glaring sunshine peculiar to the sands of Egypt, aided by the damp atmosphere common to the nights in that country and the national want of cleanliness and good ventilation, seem to be the great causes of the malady. The discharge is highly infectious and may be propagated to the most healthy.

TREATMENT.—In simple opthalmia, the treatment need consist in little more than cold water compresses. These abstract the excessive heat from the parts, relieve the smarting and favor cleanliness. When the discharge becomes muco-purulent, constituting catarrhal opthalmia, more active measures must be adopted. The eye must be freely washed with water, or with weak infusion of sambucus, celastrus and similar relaxing agents, and the bowels must be unloaded both by enemas and physic. It is generally necessary to invite the blood from the head by a general vapor bath, and relaxing sudorifics should be given where there is the least evidence of febrile excitement.

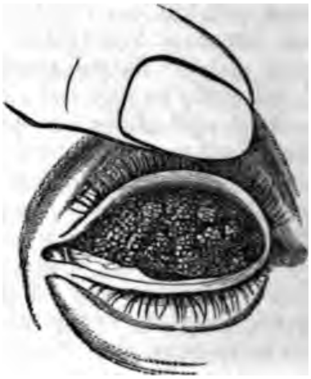
In purulent opthalmia, the treatment can not be too energetic. Thorough lobelia emetics will be found necessary in all cases and alterants must be pushed vigorously; for the system is invariably in a very foul condition under these circumstances, and no mere local application can be of any more than temporary benefit. Vapor baths daily, or even two within every twenty-four hours, will be found highly advantageous, no amount of ablution or packing sufficing to take their place. If febrile manifestations are present, they must be treated by lobelia, eupatorium and other proper agencies. Costiveness should not be allowed to continue and the condition of the urine must be attended to. When these things have been done for the patient, he will be ready for the local applications suitable to the case. Cleanliness of the parts is paramount above all other considerations. The eye, both above and beneath its lids, should be bathed frequently and freely with a weak infusion of hydrastis, salix, sumach, celastrus and similar stimulants and astringents, which should be used regularly. We have found it highly advantageous to mix a strong infusion of hydrastis with sweet oil and pulverized chalk, with which the parts may be smeared several times each day. It sustains the circulation and relieves the acridity of the discharge. The articles we have mentioned are the best eye waters that can possibly be applied, and the practitioner should never be tempted into the use of any preparation of zinc, sugar of lead, sulphate of iron or other deleterious minerals. Time and perseverance are necessary to effect a cure; and the patient's habits, both of sleep and diet, should be carefully attended to. The eye should be at all times shaded either by green goggles or, what is better, by keeping the patient in a dark room.

Gonorrheal Opthalmia.—It has been already remarked, in the chapter on venereal affections (Part II), that contact of the venereal virus with the mucous membrane of the eye will provoke opthalmia. This is a truly purulent conjunctivitis, dependent upon excoriation by a specific virus. The discharge is profuse, thick and fetid, and the conjunctiva red, swollen, painful and hot. The progress of the destruction is usually quite rapid and the pain through the orbit and head generally quite severe. The eyelid is soon denuded of its mucous lining. It is not uncommon to have ulceration advance without any reparative attempt whatever. The cornea soon becomes implicated in the destruction and the whole globe may be disorganized. The principles of management do not differ in any respect from those already mentioned for purulent opthalmia, except that the greater virulence of the gonorrheal cases demand proportionally greater activity of medication. Emetics, baths and alterants, must be pushed with that vigor which has been already directed for secondary syphilis. The system must be well relaxed by the continued use of lobelia pills, while the eye itself may be cleansed with simple water or any of the washes above mentioned. No specific antidote to the venereal poison can be applied here, any more than elsewhere; and destruction can be stayed and reparation effected only by invigorating the constitution and enabling it to resist the influence of the virus. The rapidity with which the poison runs its course to the destruction of sight, is sufficient to spur the practitioner to activity.

Scrofulous Opthalmia.—Persons of strongly marked strumous diathesis, especially children under eight years of age, are frequently troubled with a peculiar form of conjunctivitis. The membranes are seldom gorged with blood, but there is an extreme intolerance of light—so much so that the patient suffers pain even in the darkest room. There is but little discharge; the patient suffers most in the morning and enjoys comparative rest at night; the conjunctiva and cornea may sometimes be slightly ulcerated on their surfaces; there is a profuse secretion of tears and the child shuts out the light from its lids by closing its hands over them or by throwing its face upon the bed, pillow, or the shoulder of its mother. What discharge there is, is often excoriating to the cheeks as it runs down over them, not unfrequently causing irritable papillæ upon the skin. The child is strongly averse to having its eyes examined on account of the suffering that the least ray of light occasions; and its countenance and manner are expressive of pain and discontent. The treatment must be constitutional and of the same character directed for scrofula in general. Nothing can be done till the cachectic disposition is more or less removed. Eye washes seem to be of comparatively little moment, though hydrastis and sumach have been used with much success, and the preparation of hydrastis, sweet oil and chalk, above mentioned, is valuable in removing the excoriating quality of the discharge, lubricating the lids and strengthening the parts. The eyes should be bathed freely with lukewarm water and the child should not be brought into the light, except when positively necessary.

Granular Conjunctiva.—Masses of dense granules sometimes rise upon the conjunctiva, not only in connection with purulent conjunctivitis, but after excoriation of the membrane from the most simple causes. The upper lid suffers oftenest. The granules provoke irritation of the eyeball and frequently occlude the sight, proving very troublesome. They can be removed by the use of lunar caustic, which may be applied in substance to the part, touching the granules with it very lightly. The knife or scissors should never be used upon these growths. The eye should be gently irrigated with cold water after each application of the caustic.

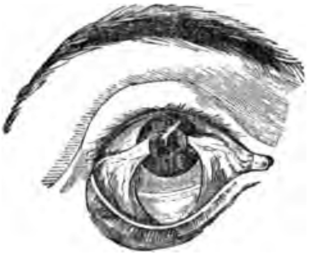
FIG. 67.



Granular Conjunctiva.

Pterygium.—This consists in fleshy thickenings of the orbicular conjunctiva, usually beginning at one or both canthi and gradually extending to the edge of the cornea, which it sometimes completely covers. The growths may be removed by pinching up the folds of membrane with the forceps and then severing them either with a bistoury or the scissors. Sometimes the thickenings are like thin webs studed with adipose spots; and the surface of the cornea is occasionally covered with a great number of small, bright red points. The webs sometimes disappear under the regular application of a mild caustic, though the eye may be

FIG. 68.



Pterygium.

injured by the contact of the escharotic with the eyeball. Their removal has also been effected by inoculation with vaccine virus.

Affections of the Cornea.

Abscesses.—Suppurative decomposition may be provoked in the cornea by the same circumstances and influences which will provoke it elsewhere. Inflammatory action is at first excited; the vessels of the part become dilated and form red zones around the margin of the cornea; the eye is painful, tears are profuse and the retina is very sensitive to light. After a short time, the vessels of the conjunctiva become engorged, the retina becomes turbid and of a bluish-white color and disintegration of its structure shortly commences. The pus may accumulate at the lower part, appearing like small white spots; or it may be distributed over the whole cornea in the form of dots, which shortly coalesce, forming the abscess. The fluid is always thin and may be discharged either inwardly or upon the surface. Treatment is to be by active relaxation, both local and general, and the vapor bath should be applied frequently with the hope of absorbing the purulent formation. When it becomes evident that this treatment is not sufficient to procure the absorption of the pus, an opening may be made through the cornea with a very fine needle, and through this puncture the material may be discharged. It is not uncommon to have a small slough follow the puncture, when a healthy ulcer remains and heals rapidly. If the pus is left to itself, it may find its way to the aqueous humor and destroy the whole eyeball.

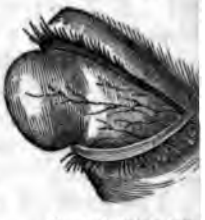
Ulcer.—Ulcer of the cornea may follow the discharge of an abscess, as already mentioned; or the tissue may be injured by violence from without or the lodgment of any foreign body. The form of the ulcer differs materially, as in other cases, being sometimes connected with a strong inflammatory attempt at resistance and again no vital effort at resistance being present. The edges of the sore may be abrupt and swollen, or thin and beveled; the surface of the sore itself may be smooth and evenly granulated, or rough, eroded and degenerate; the nerves of the part may be extremely sensitive, leading to intense pain, or they may be free from much excitement. When the ulcer partakes of the more degenerate characters, the whole cornea may be destroyed and the more exterior portions of the eyeball jeoparded. The advance of the destruction is to be prevented by the invigoration of the constitution. Vapor baths may be given, together with alter-

ants and emetics when indicated, enemas and mild ape
to regulate the bowels and tonics when the strength i
paired. The sore itself may be washed with cold v
mucilaginous articles, stimulants (as diluted compound
ture of myrrh), infusion of hydrastis, celastrus, salix, gera
or such articles as the condition of individual cases may
cate. Much cleanliness must be observed and the cour
treatment steadily maintained till the cure is effected.

Opacities of the Cornea.—Inflammatory excitement o
cornea, leading to more or less fibrinous exudation i
structures, is likely to be followed by a thin cloudiness
the part, which obstructs vision and is known as *n*
When the plastic exudation is more extensive and the
more decidedly clouded, it gets the name of *albugo.* \
the structures of the cornea have been in any way diso
ized, whether by the simplest form of suppuration or
more degenerate ulceration, the parts are still further cha
the cornea presents a dark rather than a white color, an
whole vision may be obstructed by this form of diffi
which is known as *leucoma.* The impediments may gen
be removed by that course of alterant treatment which f
absorption, especially by the vapor baths and the conti
use of pills of lobelia.

Staphyloma.—This consists of a bulging of the co
structure, the whole anterior surface of the eye protru
the iris being adherent to the projection and vision being impaired. It generally follows destruction of the cornea by ulceration. The prominence is of an opaque, whitish color, is not often painful, but causes an unsightly deformity of the face. This difficulty has been known to follow opthalmia, especially of the strumous and purulent character. When the staphyloma is small,
but little medication is required except to keep the parts
by the application of water. By this means the advan
the enlargement may be effectually checked and the
saved. In other cases, however, the staphyloma advanc
as to occupy the whole anterior portion of the eye and t
occlude the pupil, when relief can be obtained onl
puncturing the membrane with a fine cataract needle.
aqueous humor then escapes and the enlargement is te
rarily relieved. The humor, however, soon returns, irrit
of the part is provoked and the difficulty may soon be as
as it was before. When, in this way, staphyloma bec

FIG. 69.



Corneal Staphylom

very troublesome, it may be removed entirely by transfixing the base of the tumor with a cataract knife and cutting the flaps away, then wearing cold compresses in order to relieve the irritation that is provoked—by which operation the lens may be saved or an artificial eye may be worn if it is lost.

Affections of the Sclerotic and Choroid Coats.

Inflammation.—Inflammatory excitement may be provoked, in either of these coats, by any of the influences that provoke arterial excitement elsewhere. The most common form in which it occurs is that connected with a rheumatic condition of the whole system, when the arterial effort gets the term *rheumatic opthalmia.* Exposure to cold, as also syphilitic and mercurial taints, are frequently concerned in its development. It begins with a dull, aching pain, and a pink areola around the cornea. The color of the zone is sometimes quite purple, evincing extensive congestion of the vessels. There is generally an increase of tears, the eye feels hot, the pain extends to the forehead and temples. Pressure upon the ball of the eye (together with the motion of it) increases the suffering, the eye is very intolerant of light, the cornea sometimes becomes mottled with opaquish white spots and it is not uncommon to have a general febrile action excited either before or during the opthalmia. The pupil is sometimes contracted, especially when the iris suffers in common with the sclerotic and choroid coats. The vessels of the conjunctiva usually become enlarged and tortuous and the opthalmia may be general. Sooner or later, the sclerotic coat becomes thin and attenuated and the dark choroid coat is seen shining through it, giving a heavy blue appearance to the eye. When the sclerotic coat becomes greatly attenuated, the choroid coat may bulge through it, producing sclerotic staphyloma. There may be one or several staphylomæ upon the surface of the eye, and these may gradually enlarge till the cornea becomes more or less implicated, when corneal staphyloma may be developed.

TREATMENT.—The inflammation demands both local and general relaxation in order that the engorgement of blood and arterial excitement may be relieved and the contingency of suppuration averted. Washes of any relaxant, as celastrus, eupatorium or sambucus, may be applied; or poultices of ulmus or any demulcent used instead.

Local medication, however, is of comparatively slight value and no permanent relief can be obtained except by constitutional treatment. As the difficulty is usually connected with either rheumatism or venereal affections, the general course of treatment appropriate to these difficulties is demanded. Vapor baths daily, alterants in profusion, emetics, enemas and aperients frequently, with good vegetable diet, are the surest means of affording relief. When staphyloma occurs, protrusion may be relieved by puncture. When the enlargement is considerable, it is sometimes found necessary to puncture the cornea itself, thus allowing the discharge of the aqueous humor.

Muscæ Volitantes.—This term is applied to the interruption of the vision by floating bodies before the eye. It most commonly follows after inflammatory excitement of the sclerotic or choroid coats and is due to congestion, or peculiar plastic exudations, in the choroid coat. The vision is weak, the patient complains of clouds or spots floating before his eye as he moves the ball up or down or in any other direction. It is very frequently brought on by too great use of the eye, and is occasionally symptomatic of derangement of the stomach. Its removal is tedious and can only be effected by allowing the eye to rest, favoring outward determination of the blood by the use of the vapor bath, keeping the bowels free with leptandra or other purgative, relieving and strengthening the stomach by tonics or such other means as its condition may demand and invigorating the whole system by a steady course of active exercise.

Affections of the Iris.

Iritis.—Inflammatory excitement is generally provoked in the iris either by syphilitic taints, strumous depositions, or sympathy with rheumatic affections. It is first noticed by the brick-red zone which appears upon the surface of the sclerotic coat. The fibrous texture of the iris no longer retains its distinct striated form and the color of the part changes, becoming either greenish or reddish-brown. Lymph soon becomes effused either upon the anterior or posterior surface of the iris; the temple, eye and brow are painful, the pain being greatly increased at night when the origin of the case is syphilitic. At first there is a whitish ring immediately surrounding the cornea, but this soon disappears and both the cornea and the iris swell. The lymphy effusions soon pass into a low state of organization, generally coating the iris with a fine film or studding it with small nodulated points. These organizations may form an adhesion either with the cornea on the one hand, or the capsule of the lens on the other, when the iris becomes incapable of ready contraction and the background of the pupil has an irregular and jagged appearance at its edges. Sometimes blood is extravasated upon the anterior surface of the iris, forming small red spots or striæ, known as *hypolma.* At other times congestion will be so great as to favor suppuration and very small abscesses may be formed, discharging their contents upon the interior surface of the iris and the pus gravitating to the anterior chamber and constituting *hypopion.* The eye is at all times intolerant of light, vision is impaired and the patient complains of a stinging pain through the ball. In syphilitic iritis, fibrinous exudations may be so firm as to wholly interfere with the motions of the iris and suppuration occasionally so far advances as to destroy the eye. When the inflammatory excitement is provoked by strumous difficulties, the congestion is less marked than in the other cases and the practitioner is frequently deceived in the nature of the difficulty.

TREATMENT.—The slightness of the vascular connection between the iris and the rest of the system renders it very difficult to make an impression upon the former, hence when any circumstance or influence has provoked inflammatory excitement in that part, congestion is very likely to supervene before the provoking cause can be removed, and suppuration is strongly probable. Even when the case is comparatively favorable, there is such a strong probability of adhesion between the iris and the adjacent parts that it is difficult to remove the organizations without the free use of the eye being in a measure destroyed before medication can be brought to bear. Treatment should begin as soon as congestion of the iris or sclerotic is observed, and it should be of the most energetic character. When the case is of either rheumatic or syphilitic origin, nothing can be done except as the constitutional difficulties are removed; and the treatment appropriate to these difficulties must be pushed with the utmost vigor. The same may be said when the iritis is of a strumous origin. The blood must be invited to the surface and extremities by every possible means, and the tension of the arterial apparatus must be relieved by the uninterrupted use of lobelia. The patient may be kept at the point of gentle nausea a great part of the time; and all crudities of the stomach or alvine canal and all retentions, either of perspiration or urine, must be removed by the most efficient treatment that can be brought to bear upon these several parts. Alterants, in the form of sirups, are to be exhibited regularly and in large quantities, those of a relaxing character (as alnus, arctium and acer striatum) being generally preferable. A system of bathing should be pursued regularly, the vapor bath being used at least once every second day, with a warm ablution between. In acute cases, the vapor should be used every day. To the eye itself, little can be done except to keep the parts clean by the application of cold water.

If the case is taken in time and the treatment is pursued energetically, plastic adhesions may be entirely averted. If, however, these fibrous organizations have taken place and the contractility of the iris is in consequence impaired, an attempt must be made to remove the effusions by absorption. Mercurials have been long recommended for this purpose, and it is asserted that they are sufficient to remove any recent adhesions of the kind. Words need not be multiplied to show the entire inapplicability of any such agent in Physio-Medical practice. All that has ever been claimed for the mercurials can be effected, in every curable case, by the continued use of the vapor bath. The manner in which absorption is effected by this and other means has been already mentioned in the section upon *Abscess*, to which the student is referred. Long standing adhesions of the iris can not be removed even by this means; and when they will not do it, it is quite evident that no other means will.

When pus is formed or blood has been extravasated, it is best to depend for their removal upon the same process of absorption. When the accumulations are considerable, however, a small puncture may be made, at the lower part of the cornea, by a small cataract knife and the flaps then everted. Inflammatory excitement is always provoked by this operation and the practitioner will need to treat the part actively with cold compresses, or infusions of lobelia, in order to avert suppuration. This procedure should be undertaken only in extreme cases.

Mydriasis.—This term is applied to an undue dilation of the pupil. The power of contraction seems to be lost. It is always connected with amaurosis and is not uncommonly found associated with affections of the brain, as apoplexy and congestion. Again, it may be sympathetic with intestinal irritation and is sometimes caused by contusions. When the retina retains its sensibility, mydriasis seems dependent upon paralysis; but the excess of light that is admitted to the eye impairs and confuses the vision. This form of it is readily relieved by friction of the lids and brow, which may be aided by stimulating washes and the passage of small electrical sparks through the parts.

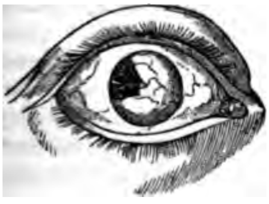
Permanent contraction of the pupil, *myosis*, is generally connected with iritis and is a common trouble with microscopists and engravers. In the latter persons, rest to the eye must be allowed; and relaxant washes are suitable when the difficulty arises from iritis.

Occlusion of the Pupil.

The pupil may be occluded by the cornea becoming either conical or opaque, by corneal staphyloma and by contractions of the iris, with fibrinous depositions over the pupil. Sight is necessarily lost and no relief can be obtained (unless the above mentioned conditions can be removed by medication) except by the performance of an operation for the formation of an artificial pupil. This may be done in various ways, according to the conditions of the parts. When the difficulty refers to the cornea alone, whether this membrane is conical or opaque, a broad needle, or cataract knife, may be passed through the cornea near the sclerotic. A very fine blunt hook is then introduced through this aperture and the iris withdrawn through the opening and cut off with a pair of fine scissors. The point selected for this operation should be below the middle line of the eye and rather inclining to the nasal side. When the cornea is adherent to the capsule of the lens, the aperture should be of considerable size to allow a large portion of the iris to escape, which may be removed by the scissors as before.

If the occlusion is caused by staphyloma, or opacity of the cornea with adhesion of the iris, the same operation may be performed. When the cornea is clear and the difficulty is mainly owing to tension of the iris with contraction of its fibers, as also when there have been effusions of lymph following either inflammation or the operation for cataract, a small iris knife may be introduced through the sclerotic near its junction with the cornea, the point of the instrument being carried in front of the iris and then withdrawn in such a way as to gently cut the tissues of the annulus through nearly one-half of its diameter. The contraction of its fibers then makes a sufficient enlargement for the admission of light,

FIG. 70.



Occlusion of the Pupil by Opacity of the Cornea.

Maunoir operated by incising the cornea with the cataract knife and severing the iris by a very fine pair of scissors. In some instances, a single incision may not be sufficient, but two incisions, in the shape of a letter V, may be necessary. Any operation of this kind will be invariably followed by inflammatory excitement, and suppuration is frequently provoked. Care must be taken, therefore, to prepare the system before operating and soothe the parts by cold applications afterward. No operation whatever should be performed when the retina has been impaired, and till it is evident that the opacity of the cornea and the fibrinous deposition can not be removed by medication.

Cataract.

Cataract implies an opacity of the crystalline lens, or of its capsule, or of both. The lens is most frequently affected and old persons are more subject to it than young. The opacity usually begins in the center, where it appears as a milkish white spot, or cloud, from which it gradually extends to the circumference till the whole pupil becomes occupied by it. At other times, however, it may begin near the circumference, or at irregular spots upon the pupil; but it sooner or later occludes the sight. In the majority of instances the opacity is known as *hard* cataract, which is most common to old persons and usually presents an amber tint; or it may be amber colored in the center and gray at the circumference. The lens in this variety is shrunken and hard. In the *soft* cataract, a bluish grey, or pearly white, color is presented. This variety most frequently troubles persons of middle age and causes projection of the lens against the iris, interfering with the motions of the latter. In still another variety, the cataract is said to be *radiated*—in which form it usually commences at the circumference and extends toward the center.

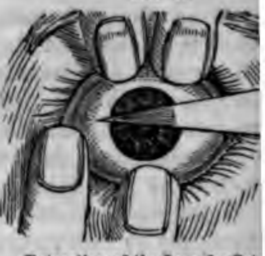
Impairment of vision is the first and prominent symptom of cataract and may be complained of by the patient even before the practitioner observes the cloudiness of the lens. Loss of sight advances gradually—being at first merely an obscurity of vision, but ultimately leading to a total inability of distinguishing objects, though never advancing so far but day may be dimly distinguished from night. There are usually slightly unpleasant feelings through the eye and forehead and the pupil is generally dilated; a strong light, in consequence of contracting the iris, admits less vision than a dim light, which favors its relaxation, hence the patient's sight is better at evening than it is at noonday. The cloud beneath the pupil is plainly distinguishable by the naked eye, being slightly removed from the iris when the lens alone is affected; appearing to be almost directly against the iris when the anterior portion of the capsule is affected; and remote from the iris when the posterior portion of the capsule is the seat of the difficulty. The impairment of vision in cataract can be readily distinguished from the loss of function in amaurosis and glaucoma by the abscence of the unnatural color peculiar to the pupil in the last named difficulties. The vision is not entirely lost in cataract, but only clouded; objects (so long as they are seen at all) remain of their natural shape and color; there are no sparks of light before the eyes when shut and but two images of a candle can be seen before the eye—all of which circumstances are reversed in amaurosis. The images as reflected by the eye, familiarly known as the *catoptric test*, is one of the most positive diagnosing signs in cataract. In order to apply it, the patient is to be seated in a dark room and a lighted taper moved up and down before him. The surgeon having shaded his own eyes by his hand, or some other object, is prepared to distinguish either the presence or abscence of the three images which are observed both in the natural eye and in cases of amaurosis, one of which (the inverted image that is reflected from the posterior surface of the crystalline lens and which moves downward when the candle is raised upward) is wanting in all cases of cataract.

The causes of cataract are comparatively unknown. The difficulty is evidently dependent upon plastic or fibrinous changes in the lens or its capsule, and it is most probable that these changes are brought about by inflammatory excitement in the parts, as already mentioned. However, aged persons seem to be troubled with it at times and under circumstances when the difficulty can scarcely be supposed to arise from any thing but want of nutrition.

TREATMENT.—Nothing can be done, either to prevent or remove cataract, short of an operation. At times, the advance of the difficulty seems to have been checked by a purifying course of medication, especially by the use of vapor baths and alterants. The delay in the advance of the opacity, however, is only trifling, and no permanent relief can be expected except in a resort to the knife. Two operations may be performed, the lens being either removed by extraction or depressed and shoved downward from its position behind the pupil. The operation of extraction is the one most commonly performed and is altogether the most effectual. Neither one should be attempted till the system of the patient has been well prepared by unloading the bowels, regulating the secretions, relaxing the tissues by the use of lobelia and obtaining a good state of the appetite.

1st. *Extraction*. In performing this operation, the patient is

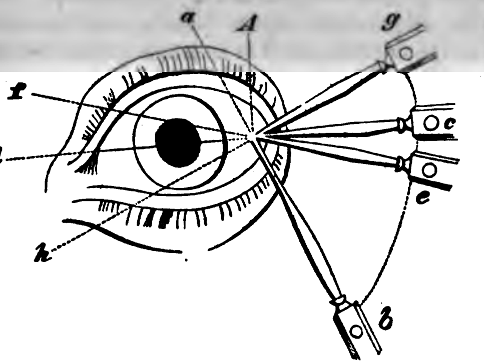
Fig. 71.



Extraction of the Lens for Cat

first to be seated before a pretty strong light. Clear su causes too great a contraction of the iris and the face s be at all times turned obliquely to the rays which ent window near which the patient is seated. A triangular ract knife should be then introduced through the cornea within about a line of its margin—beginning at the external edge, being passed across the anterior chamber and brought out through the cornea within a line of its nasal edge. The instrument should be introduced with much steadiness (the cutting edge upward) and advanced carefully across the chamber of the eye; the advance being stopped only when th of it comes in contact with the iris. Should this occu iris may be pressed back gently and the incision conti or the knife may be withdrawn and a pair of probe-p scissors used to complete the flap. The whole upper p of the cornea is to be severed. During this operation, t should be pr retracted by a sistant, who s also steady globe by g pressure upo The flap h been complete lids may be al to close and th to rest for a ment; the p may be then t with his ba the light, very tle pressure upon the unde of the globe the upper e and the lens thus extruded from the opening. The oper is now completed—the only further care needed being t vent the iris from becoming collapsed, which may be do suddenly turning the patient to a strong light or by pu back the extruded portion with the blunt extremity of a ble probe; to see that the flap of the cornea is in its p

Fig. 72.



Couching for Cataract. The needle is introduced through the sclerotic in the direction of *a*, *b*, then carried to the position *e*, *f*, when the point of the instrument becomes engaged with the top of the lens. The handle of the needle is to be then carried up to *g*.—Pancoast.

position and then to close the lid, exclude the light, keep the patient perfectly quiet, caution him against sneezing or coughing or rubbing the eyes, and apply cold compresses to the lid. The patient should be then put to bed in a dark room, a light bandage placed over the eyes, quiet and closure of the lids carefully maintained and a light diet enjoined. The lids should not be separated, except to examine the progress of cure, for a fortnight; and, even then, none but the mildest rays of light should be admitted to the eye. Arterial excitement is to be relieved by the same means suitable to all and every other case of inflammation, the strength and freedom of the system are to be carefully maintained and the full use of the eye should not be allowed till several weeks have elapsed.

2d. *Depression or Couching.*—In this operation, a straight couching needle is introduced through the sclerotic, a little beyond the margin of the cornea, and shoved forward and upward over the anterior chamber of the eye. The point of the instrument having been brought against the upper edge of the lens, the hand is steadily raised and the lens pushed downward. The lens is thus displaced from its position behind the pupil, when the needle is carefully withdrawn. Inflammatory excitement is always provoked by this operation and suppuration is strongly probable. This, together with the possibility of injuring the vitreous humor and of the upward return of the lens, has brought this method of procedure into disrepute.

Dislocation of the Lens.

The crystalline lens may escape from its capsule, either into the anterior or posterior chamber of the eye, through a rupture made in its investing membrane by the infliction of a wound, a blow or other sufficient violence. When it falls into the anterior chamber, it may be impacted between the iris and the cornea; when it falls into the posterior chamber, it usually presses the iris forward, obliterating the anterior chamber. In the first position, it can be distinctly seen in front of the pupil, where it appears like a floating cataract. The accident always provokes violent inflammatory excitement, in which the whole eye soon becomes engaged, and suppuration of the entire orbit may ensue. In more favorable cases, the lens withers and is absorbed away—the opaque capsule alone remaining floating like a sac in the aqueous humor. The diagnosis of this accident requires a very careful examination: the pupil should be dilated for this purpose and the catoptric test applied.

Treatment.—The arterial excitement should be relieved, as soon as possible, by the application of cold compresses, poultices of ulmus and lobelia and the general exhibition of relaxants. Suppuration may be averted by these means and no further ill effects be observed. When suppuration seems strongly probable, the wound of the capsule having been violent, the lens must be extracted. In the majority of instances, the cornea requires to be incised in the same manner as for cataract. In a few rare cases, the lens is forced through both the choroid and sclerotic coats, from which position it may be readily removed by an incision through the conjunctiva.

Retinitis.

The retina may be intensely excited by exposure to too strong a degree of light or heat, by direct injury, by the presence of the depressed lens (as after the operation of couching) or by an inordinate use of the eye. It also necessarily sympathizes with all the arterial excitements of the eyeball. The patient suffers the most agonizing pain, which is increased by the slightest motion and is not only deep-seated in the eyeball, but even extends through the temples and forehead. There is an increased flow of tears, sparks of light float back and forth before the eyes, vision is impaired, or even lost, there is an utter intolerance of light, and fever and delirium may even be provoked where the injury is unremoved or the obstructions of the capillaries unrelieved. Total blindness ultimately ensues and the whole eye may be lost by suppuration. In less acute cases, the symptoms will be proportionally diminished in intensity. Treatment can only be effectual when it is of the most energetic character. The patient should be put upon lobelia and the system kept at the point of gentle relaxation; the bowels should be freely unloaded, the surface bathed, the patient kept in a dark room and lobelia freely applied to the eye itself. After relief has been obtained, the patient should resume the function of sight very gradually and carefully.

Amaurosis.

By this term is understood an imperfection of vision consequent upon a change in either the retina, optic nerve or brain. This change may consist in interference of function by pressure upon any of the nerves supplying the eye (as by tumors, extravasated blood and inflammatory effusions) or in over stimulation and exhaustion of the retina, organic change in the parts themselves, undue and long continued congestion, etc.

This strange affection may manifest itself in the most endless diversity of ways. The patient may speak of black or shining clouds floating before the eye, and he may seek to shade the eye from these imaginary objects. Again, objects may not appear sufficiently illuminated, which leads the patient to stare at them and examine them closely and to continually ask for more light in the room. Symptoms of retinitis may be manifested, when the patient will complain of more or less pain; the ocular spectra are noticed at irregular intervals, seeming to dance before the eye, and the iris gradually becomes dilated and is not contracted by exposure to the strongest light. Before this occurs, however, the function of vision must become greatly impaired; the patient will, at the same time, have a staring, vacant look; the gait will be uncertain and unsteady; the eyelids move but seldom, while the eyeballs not uncommonly have an oscillatory motion. These symptoms, however, are subject to the greatest imaginable variation—some patients suffering constant pain and others suffering no pain at all; some being incapable of bearing light while the great majority complain that there is not light enough, and some becoming wholly blind while (in others) impairment of vision will advance to a certain point and remain stationary. During the early stages of the affection, some patients see objects double, while others see but half of them; some can see directly before them, while others can see only to one side. In a few rare cases, the iris retains its ability to contract and the pupil appears but slightly dilated. The destruction of vision may be speedy; but, in most cases, months or years elapse before this point of derangement is reached. Females, scrofulous persons and those having black eyes, are most liable to be troubled with amaurosis.

TREATMENT.—Treatment is in all cases unsatisfactory and it is seldom that the progress of the affection can be stayed. When it is caused by extravasated blood, the pressure of a tumor upon the optic nerve or any of its branches, or by the chemical destruction of the retina and its connections, medication is utterly useless. When it is preceded by retinitis, the same mode of management that has been already directed for those cases of inflammatory excitement may ultimately restore the parts and preserve the functions. When the difficulty is sympathetic (which is not unfrequent), the general purification and toning of the system is likely to prove serviceable. When congestion exists and there is a strong tendency to engorgement of the brain, the use of the vapor bath will afford relief by inviting the blood downward. Persons of a strumous diathesis should be put upon a course of alterant treatment; and it has been recommended to pass sparks of electricity through the retina and pupil. It must be confessed, however, that most of these means are recommended as experiments rather than for any good results that they have ever wrought; for between the remote position of the affected parts and the manner in which they depart from a state of health, amaurosis may be safely classed among the incurable maladies.

Glaucoma.

Glaucoma is simply one form of amaurosis, the peculiarity being that the pupil appears to be of a dark green color. The nature of the difficulty is but little understood, some supposing that the choroid coat is implicated, others maintaining that the whole malady is attributable to an affection of the retina, while still others contend that the lens and vitreous humor are at fault. Diagnosis from cataract can be readily made by observing the color, by the want of opacity in glaucoma, and by the before mentioned catoptric test. Treatment is in all respects unsatisfactory. Sometimes, however, a thorough course of alterants, tonics and relaxants, may stay the advances of the difficulty; and a series of vapor baths, relaxants and secernants, may effect a cure when the glaucoma seems dependent upon a rheumatic or gouty state of the system.

Tumors.

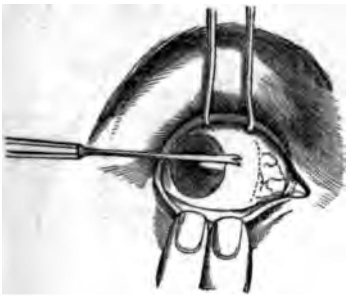
Medullary cancer of the eyeball is occasionally met with, especially in young persons. Its chief point of origin is upon the retina, from which it advances externally, completely clouding vision and ultimately involving the whole ball. When it reaches the choroid and sclerotic coats, ulceration advances rapidly, the patient is speedily exhausted, large fungi are thrown out, fatal hemorrhage may ensue and speedy death is certain. No means of management are of any value except that of direct and total extirpation of the eyeball. This should be performed by incising the outer angle of the lids, then seizing the globe with a volsella, when a straight-edged bistoury is used to separate the ball from its orbit. Care must be taken not to press the point of the knife too strongly against the orbital plate, and the optic nerve is to be severed by a direct incision. The lachrymal glands must be removed and every diseased portion of the structure must be taken away; the orbit may be then cleansed and filled with pledgets of lint and the parts cared for in the ordinary manner directed for wounds.

Strabismus.

Squinting is usually a congenital deformity, though it may be brought on during the early years of life by straining the eyes inwardly, or looking "cross-eyed." We have met with one case in which the difficulty resulted from a wound through the internal rectus muscle. Usually, one eye only is affected, but the other eye commonly loses its proper position by apparent sympathy with the deformed one. The ball is most frequently rolled inward, but occasionally looks outward. The difficulty depends upon want of harmony in the action of the recti muscles, one becoming too tense while the other is too relaxed. It causes no other inconvenience than the unsightliness of the deformity.

TREATMENT.—Strabismus is readily relieved by severing the tendon of the muscle of the side to which the ball is drawn. Place the patient upon a chair, cover the sound eye and open the lids and fix the ball of the unsound one by the aid of assistant's fingers. A small, sharp hook may be then inserted into the orbicular conjunctiva and the ball rotated to the side contrary to that toward which the deformity has drawn it. The mucous covering may be then pinched up by a pair of small forceps and a perpendicular incision made through it, a little behind the insertion of the rectus, by a pair of scissors or a suitable knife. A blunt hook is inserted through this incision and passed behind the muscle, which is then drawn forward and lifted upward. A pair of blunt pointed scissors is then passed in and the muscle severed by them at a point varying from the one-eighth to the one-fourth of an inch from its insertion into the sclerotic. The eye is then closed and bandaged, cold water compresses applied if

FIG. 73.



Operation for Strabismus—the Hook inserted and the Eye rotated outward. The Dotted Line shows the point for incising the Conjunctiva.

arterial excitement becomes considerable and the patient kept quiet for several days. The eye does not gain its true position and full power immediately, but gentle use soon brings it straight and accustoms it to the new angle of incidence.

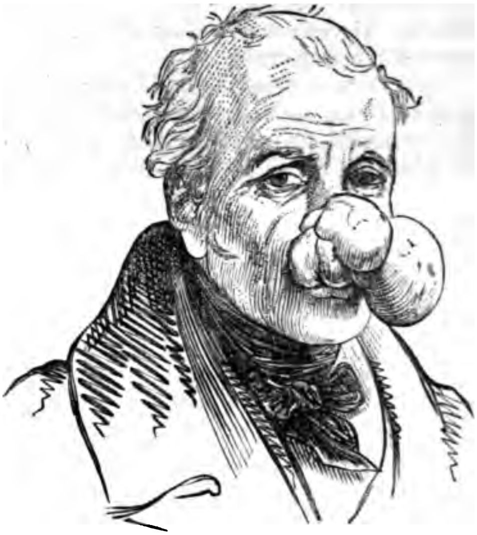
CHAPTER XI.

AFFECTIONS OF THE FACE.

Affections of the Nose.

Lipoma.—This term is applied to an hypertrophied condition of the skin and adipose tissue about the nose, the enlargement being sometimes very considerable and usually caused by too free living. Sometimes lipoma almost resembles sarcomatous tumors, of which there may be one or several on the apex and alæ. They enlarge slowly, are usually indolent, seldom painful and cause no inconvenience except when they attain a considerable size. They can be removed by excision, the growth being cut down upon and dissected out by the scalpel. The whole of the integuments should be removed and the blood checked in the ordinary manner. The wound heals slowly.

FIG. 74.

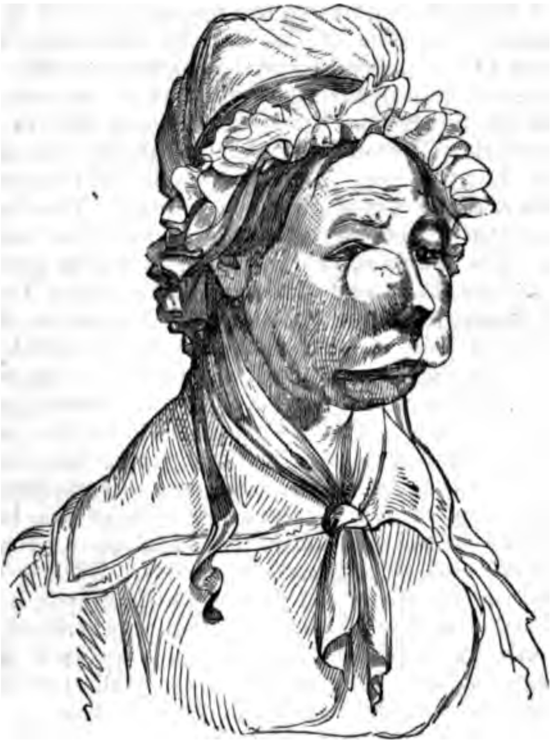


Lipoma of the Nose.

Polypus.—Four varieties of nasal polypi are enumerated by authors: 1st. The *gelatinous*, which is usually pear shaped, attached to the mucous membranes over the sides of the turbinated bones and consists of a yellowish looking mass of organized lymph. 2d. The *hydatid*, which consists of a number of watery vesicles. 3d. The *medullary*, which is a cancerous growth within the nasal passages. This variety occurs most frequently in elderly persons and is accompanied by the peculiar pain, redness and cachexy, common to other cancerous growths. 4th. *Fleshy* or *fungoid*, which strongly resembles fungous hematodes, growing rapidly and bleeding freely. The last two varieties frequently produce death. The gelatinous form is altogether the most common.

The first symptoms of polypus consist in a sense of stuffing in the nostril, which provokes a constant disposition to blow the nose. There is a redundant discharge of mucus, which may be mistaken for the catarrh; a sense of constriction and difficulty of breathing, increasing in damp weather; and the growth is usually quite slow and one nostril alone is generally occupied. Both nostrils, however, may be thus affected, and the enlargement of the polypus may be so great as to displace the sides of the nose, causing deformity of the face; it may compress the jugular vein and cause dizziness in the head

FIG. 75.



Frog-face—Deformity caused by Polypi.

and even block up the Eustachian tube, leading to dea
Smelling is necessarily interfered with from the first
natural resonance of the voice is lost and the patient i
to "talk through the nose;" the free passage of tears i
vented and death may be caused by pressure upon the

TREATMENT.—When a polypus of the nose is pedunc
it should be removed by ligature. A double noose of
may be passed into the pharynx through the affected n
when it will expand and may be drawn back and guid
a probe so as to grasp the base of the tumor; a double c
may be then passed into the nostril, a free end of the lig
being drawn through each tube and tightened upon the
in such a manner as to force the opposite end of the c
snugly against one side of the stem of the tumor, whi
cord is thus firmly pressed against the opposite side. I
manner the circulation through the part is at once str
lated and, by tightening the ligature from day to da
morbid growth will soon be removed. When the poly
large and flat, the long blades of a pair of forceps m
introduced and the tumor grasped by them. The force
then to be gently and carefully twisted and the tumor
removed. The whole of the growth may not be grasped
removed at one time; and the surgeon may find it nece
to bring it away by piecemeal. The operation shou
repeated from day to day, that the enlargement m
gradually encroached upon and the parts not be too
irritated by the continuousness of the operative proce
This mode of treatment is only applicable to the gelat
tumors. In the fibrous tumor, the ligature may be ap
when the form is pedunculate. When the enlargement
a flattened form, neither ligature nor forceps can be o
avail, and the scalpel must be employed to remove the gr
as well as the part from which it springs. This is ren
necessary from the fact that this variety of polypus is str
disposed to degenerate ulceration, which may seriously in
the patient's life. "No fixed rules can be given to guid
operative procedure. It may be possible to disclose the t
and its site sufficiently by simple incision of the nostril;
may be necessary to remove a portion of the superior m
lary" (Miller).

Epistaxis.—Hemorrhage from the nose is a very con
accident, but one to which the surgeon is seldom called
a few instances, however, the loss of blood is so persistent
the life of the patient may be jeoparded, when surgical i
ference becomes necessary. No simple mode of procedu
equal to that of bathing the feet, hands and face with

as warm as it can be borne. This invites the blood to the extremities and relieves engorgement of the parts. It is very seldom indeed that this mode of management will fail. The arteries supplying the Schneiderian membrane may be obstructed by putting some moderately firm substance under the upper lip and then passing a fine piece of tape tightly across the lip on the outside. For other modes of arresting hemorrhage, see the chapter upon this subject.

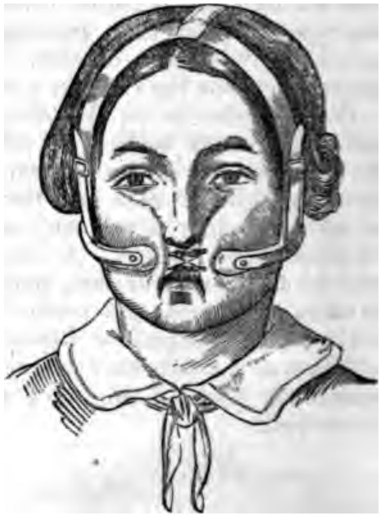
Foreign bodies in the Nostrils.—When pebbles, peas, beans and similar small bodies, get within the nostrils, the effort of the child or parent to abstract them usually pushes them further within the nose and they are soon beyond the reach of the eye. In general, they are readily extracted by a pair of thin-bladed forceps. A bent probe or ear scoop may be used for the same purpose; and it is frequently advantageous to make cuts across the probe in such a manner that, when the instrument is pushed beyond the foreign body and then withdrawn, the cuts may act as barbs, entangling themselves against the edge of the solid and thus gradually working it downward.

Affections of the Lip.

Harelip.—Harelip consists in a congenital malformation of the upper labium, the substance of the lip not being completed during gestation, but a perpendicular fissure being left through it. This fissure, or cleft, is usually upon one side of the mesial line, but is occasionally met with upon both sides, a strip of flesh being left between and pendant from the septum of the nose. The latter cases are known as *double* harelips and cause much more unsightly deformity than where the cleft is single. The fissure is usually confined to the lip alone, but it is common to have the deficiency of integument extend to the jaw, and even back through the whole roof of the mouth to the palate.

Harelip can be cured only by an operation, which has for its object the denudation of the edges of the fissure and then their approximation—by which procedure granulation may be effected between the two parts and the gap thus obliterated. In performing this operation, the lip must be first lifted up and a piece of horn or pasteboard placed under it. The point of a straight-edged bistoury is then inserted in the upper part of the fissure and the edge of the cleft severed by one sweep from the nose to the margin of the mouth. The same is done with the other side of the cleft, care being taken to begin both incisions at the same point in such a manner that there may be no bulging of the integuments when the bared edges of the wound are brought together. Some surgeons prefer to make these incisions slightly curved, the convexity of the curve looking outward from the edge of the cleft. The two edges of the wound are then to be approximated, two curved needles inserted through them and a figure-of-8 suture twisted over each needle and then continued from one needle to the other. The needles should be of silver, properly curved and introduced at a suitable depth in the integuments. In order to prevent any strain on the needles, Mr. Fergusson has recommended an instrument to be applied to the head in such a manner as to press the cheeks gently forward at this point. The apparatus may be readily imitated by putting a compress upon each cheek and then passing a bandage around the head and over the upper lip, in such a manner as to press the pad and the integuments of the cheeks gently forward. The edges of the wound having been smoothed and the angle properly adjusted, union takes place readily. The pins may be removed at the end of the fourth or fifth day, if deemed prudent, when the straight scar of the operation will be the only remaining evidence of the deformity.

FIG. 76.

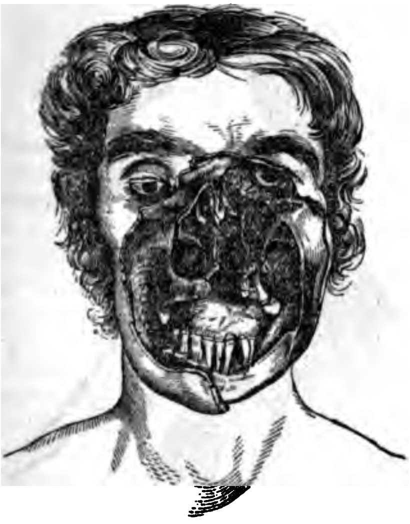


Fergusson's Apparatus for maintaining the position of the parts after operation for Harelip.

When the harelip is of the double variety, the same principles are to be observed in the operation, with the exception that the condition of the parts sometimes make slight differences in the mode of procedure. Where there are two distinct fissures in the alveolus, and the intermediate portion is small and prominent, it may be entirely removed by the bone pliers and the outer edges of the integuments denuded and brought together. But where the intermediate piece of alveolus is large, the edges of the integument above it may be denuded, as also the outer edges of the lip, and then all the parts brought together by suitable pins and ligatures.

Cancrum Oris.—This term is applied to a degenerate ulceration of the lips, which usually commences in the form of small cancroid warts either upon the cheeks or the mucous membrane of the labii. Elderly persons are most subject to it, and it occurs only in those of weakly constitutions and in persons of bad habits. It is a true sloughing phagedena, is liable to destroy the parts for a considerable distance and presents many of the features of lupus, which may be called cancrum oris of a mercurial origin. It may be treated by the application of demulcents and stimulants, or demulcents and relaxants, according to the degree of indolence or sensibility in the parts. The principles which guide the practitioner in the management of all ulceration are applicable here, and the state of the constitution and the habits of the patient must be attended to. When the ulcer enlarges persistently and manifests a disposition to degenerate into a cachectic condition, nothing short of early excision of the parts is likely to be of any avail.

FIG. 77.

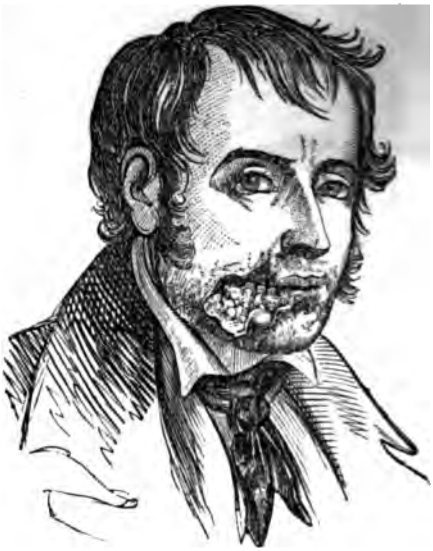


Lupus.

Lupus—Noli Me Tangere.—This is a phagedenic ulceration which usually commences upon the upper lip or near the alæ of the nose. It first appears in the form of small tubercles, which exude a thin liquor that gradually dries into a scab, underneath which the ulcer forms, eroding the tissues and gaining a foothold upon the integuments before the surgeon is really aware of the nature of the difficulty. The parts inflame, become hardened, the discharge is foul and the advance of the ulceration is usually rapid. In mild cases—especially in scrofulous children—the ulceration spreads upon the surface, advancing over the whole lip, upon the cheeks and upward upon the nose. In more degenerate cases, however, the deeper integuments speedily become involved and the tissues are eroded even to the bones. The whole face may be involved in the destruction, which may advance along the Schneiderian membrane and engage the turbinated bones, reach the alveoli and loosen the teeth, and even extend from the chin to the forehead, destroying the eyes, causing the most horrid deformity and leading to the most painful death. Nearly all this latter class of cases have a mercurial origin—the destruction usually beginning in the alveolus and involving the integuments secondarily. Syphilis also, at times, particularly the mercurio-syphilitic taints, seems to lay at the foundation of the development of these ulcers.

In scrofulous cases, lupus may be satisfactorily treated by the local application of celastrus, rumex or sambucus, and by attention to the state of the system as a whole, after the manner which has been already directed for scrofula in general. Excision of the parts is sometimes demanded, and may be successfully practiced if attempted before the ulceration advances far. When lupus is of mercurial origin, its degeneracy is such that it is usually impossible to stay its advances and death is nearly always inevitable. A cure may be attempted, however, by the use of baths, alterants, emetics, electro-chemical currents and the other means which are calculated to purify the system and eliminate morbific materials from it. To the part itself, little can be done beyond keeping it clean—though the ulcer is usually of the irritable form and may be treated by demulcent and relaxant applications, as has been already advised for sores of this class. The main dependence, however, is to be placed on constitutional medication.

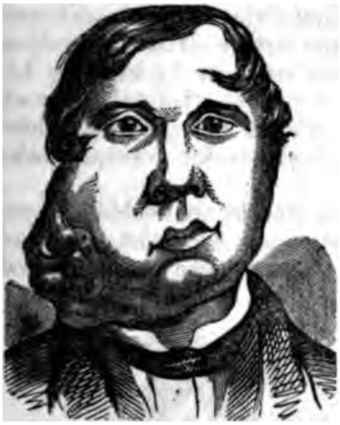
FIG. 78.



Scirrhous Cancer.

Cancer.—The lips are frequently troubled with carcinomatous depositions, which are almost invariably of the scirrhous form. The lower lip is chiefly affected and the enlargement and ulceration usually appear in the angle of the mouth. It generally commences in the form of a small fissure, to which the patient is too apt to pay but little attention, attributing it to the irritation of smoking—it being a peculiar fact that but few other than smokers are troubled with cancer at this point. The discharge is thin and excoriating, the ulcer soon enlarges and advances correspondingly over the integuments, presenting the cartilaginous edges and ashey-grey surface peculiar to scirrhous ulcerations. Little can be done unless the treatment is begun at an early day, when the whole difficulty may be eradicated by removing the parts affected with two elliptical incisions. The constitutional treatment, already advised for cancer, should be at the same time pushed vigorously and the use of the pipe or cigar strictly forbidden. Excision, however, is seldom successful unless in mild cases, yet the operation may be attempted when the ulceration has extended over a considerable surface; for if the radicles of the carcinomatous materials can be reached, the patient's life may be preserved for several months longer than he could be expected to survive if the malady was allowed to advance unchecked.

Fig. 79.



Cancroid Tumor of the Cheek.

Cancroid Tumors.—Very serious cancerous enlargements sometimes commence upon the cheeks. When the difficulty partakes of the scirrhous form, it is frequently amenable to treatment; but when the enlargement advances pretty rapidly, ulcerates early and presents peculiarities intermediate between scirrhous and encephaloma, no remedial measures are likely to be of any avail.

CHAPTER XII.

AFFECTIONS OF THE MOUTH AND JAWS.

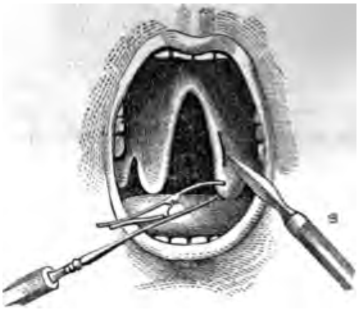
Affections of the Palate.

Cleft Palate.—This implies a congenital deficiency of the palate and uvula, consisting in defective development of these parts which leaves a fissure through them. The soft palate alone may be affected, or the cleft may extend through the hard palate from the uvula to the lips, being not unfrequently continued externally and constituting harelip. In a few instances, the fissure in the hard palate is but small and it may fill up and disappear in the course of a few years; but the cleft more commonly continues through life (unless relieved by surgical interference), usually causing much difficulty of swallowing and giving an indistinct and nasal utterance to the voice.

Deficiency of the soft palate may be remedied upon the same principles which guide the surgeon in treating harelip, namely, the denudation of the edges of the cleft and then their approximation by sutures, with the design of favoring structural adhesion. Before proceeding to this operation, the surgeon must first see that his patient enjoys good health and is of sufficient age to understand the nature of the operation and to second the attempts of the surgeon by keeping his mouth open during the operative procedure. Indeed it is well to train the patient to hold his mouth open, and get him accustomed to keeping it in this position, for several weeks before the operation is attempted.

This having been done and the operation decided upon, the patient is to be seated before a strong light, his head thrown back and sustained by an assistant, and then directed to open his mouth widely. One edge of the palate is then to be seized by a volsella, drawn gently downward and forward and incised longitudinally, about one-eighth or one-fourth of an inch from its margin and the whole edge cut off from the angle to the uvula. Each side is to be served in this way and the patient should be then allowed to close his mouth and rinse it with water and wait a few hours till the bleeding stops. The next procedure consists in severing the levator palati muscles. This is rendered necessary from the fact that, as soon as the palate is touched, these muscles contract spasmodically and separate the edges of the fissure; and were an attempt made to hold the parts together by sutures, not only would the introduction of the ligatures be found very difficult, but their presence would cause constant contraction of the parts, thus putting a strain upon the sutures and wholly preventing the adhesion of the denuded edges. Mr. Fergusson was the first to clearly define the source of this contraction and to point out, in practice, the necessity of separating the muscles. He thus describes his mode of procedure: "With a knife whose blade is somewhat like the

FIG. 80.

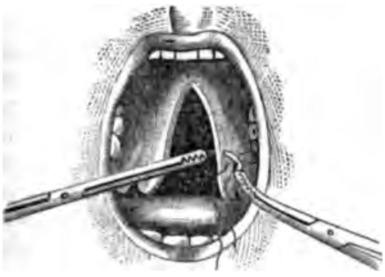


Denuding the edges of the fissure in Cleft Palate.

point of a lancet, the cutting edge being about a quarter of an inch in extent, and the flat surface being bent semi-circularly, I make an incision, about one-half an inch long, on each side of the posterior nares, a little above and parallel to the palatine flaps, and across a line straight downward from the lower opening of the Eustachian tube, by which I divide the levator palati on both sides, just above its attachment to the palate. Next I pare the edges of the fissure with a straight bistoury, removing little more than the mucous membrane; then, with a pair of long blunt-pointed curved scissors, I divide the posterior of the fauces, immediately behind the tonsil, and, if it seems necessary, cut across the anterior pillar too; the wound in each part being about a quarter of an inch in extent. Lastly, stitches are introduced by means of a curved needle set in a handle; and the threads being tied, so as to keep the cut edges of the fissure accurately in contact, the operation is completed."

Dr. Sanborn, of Lowell, has recently reported his treatment of a case of cleft palate with his mode of separating the levator muscles. He prefers to divide the muscles at the base of the hamular process of the sphenoid bone. He thus describes his mode of procedure (Boston Med. Journal, June 11th, 1857, p. 370): "The depending portion of the left side was seized with the forceps, as before; the hamular process made out with the finger; then a straight, double-edged, pointed bistoury was entered close by the edge of the process, and thrust completely through the palate, in an upward and inward direction, in such a manner that the point of the knife could be brought to view through the fissure. By a slight movement backward and forward of the handle of the knife, the levator was divided without enlarging the wound through the palate. The section was shown to be complete, by the side of the palate yielding to the traction of the forceps, and by its hanging at a lower level than the other portion when the knife was withdrawn. The opposite side was treated in the same manner. The two flaps of the palate were now perfectly passive, and the fissure was considerably narrower than before the operation was commenced." After the edges have been thus bared and the muscles separated, one or two sutures are to be passed through

FIG. 81.



Taking stitches in Cleft Palate.

the sides of the palate for the purpose of bringing their edges together. The needle holding the suture should be held firmly with a pair of long forceps, and the knot of the ligatures should be tied firmly and in such a manner that they will not yield. The patient should then be allowed to rest and directed to not talk, take food, or, if possible, to even swallow the saliva, for several days. Where the parts can be maintained in close approximation, they are generally united in a perfect manner.

When the fissure extends through the bony palate, but little attention need be paid to it if the soft palate has been successfully operated upon. Sometimes, however, the cleft through the bone is so considerable as to still cause unpleasant sensations in the mouth. The structures may be sometimes approximated by maintaining steady lateral pressure during the period of growth. A wedge of gold or caoutchouc has been recommended to be worn to fill up the fissure.

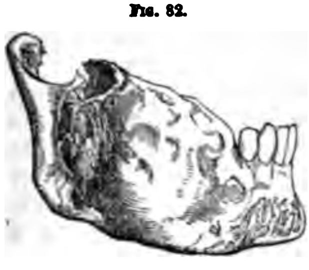
When the cleft extends only through the uvula, or the fissure is narrow and long, an operation may be saved by touching the angle of the opening with a stick of solid caustic. This denudes the edges, which, from their proximity, will cicatrize readily. The act of cicatrization draws the parts closer together; and by repeating the operation at intervals of ten, twelve, or fourteen days, the whole fissure may be thus gradually cicatrized. This mode of management is only applicable to cases where the deficiency is trifling.

Affections of the Jaws.

Abscess of the Antrum.—Purulent accumulations may take place in the antrum as a sequence of external injury, abscess in the jaw or the irritation of decayed teeth. Inflammatory action always precedes decay—the progress of decomposition being either acute or chronic, according to the condition of the patient and the nature of the provoking cause. There is a sense of fullness, pain and tension through the cheek, with febrile disturbance when the case is an acute one. The cheek swells, the bones becoming attenuated and crackling under pressure; there may be increased secretion from the nostril, and, at times, the fluid in the cavity may be felt to fluctuate. When decaying teeth have been the cause of the suppuration, they should be removed early, and this may give vent to the purulent accumulation. If this does not prove sufficient, the parietes of the antrum may be punctured with a suitable trocar and the whole of the purulent material evacuated. When the membrane of the antrum has become much degenerated, it may be necessary to syringe the cavity with tepid water or with medicated fluids. Proper attention to the state of the general health will then prove sufficient to restore the parts to their normal vigor.

Tumors.—Osteo-sarcoma (commonly called spina ventosa) is common to both the superior and the inferior maxillary, occurring at different points and attaining various sizes. An example of a tumor of this class on the upper jaw has been already presented at figure 53. Similar enlargement of the lower jaw may be seen in the adjoining cut. The inconvenience caused by these tumors depends upon the size they attain, as well as upon their position. When they extend inward and upward, they may seriously impede mastication and articulation. They do not often interfere with the state of the general health. Free and fearless excision of the growth may be practiced in all cases.

FIG. 82.



Osteo-Sarcoma—Macerated bone.

Osteo-cephaloma not unfrequently affects the jaws and is occasionally met with in the palatal bones, growing rapidly and soon becoming serious, involving all the structures around it and discharging fetid material profusely. Little can be done further than to employ the most energetic constitutional treatment. In recent cases, where it is evident that but a small portion of the bone is affected, excision of the mass may be practiced successfully. The mode of removing all or part of either of the maxilla, will be considered in Part V. of this volume.

Affections of the Teeth and Gums.

Caries.—This is one of the most common affections of civilized society, being mainly dependent upon want of cleanliness in the mouth and the improper use of sweets and too sudden changes from hot food to cold drinks. The decay generally begins at the surface of the tooth and gradually advances inward till it exposes the pulp. The nerve being thus laid bare, toothache is invariably provoked. When the decay has just commenced and has scarcely advanced beyond the enamel, the surface of the caries may be cleansed and the cavity stopped with gold, or a cement made of gum mastich and ether, after which cleanliness of the mouth and abstinence from the above mentioned provoking causes, may stay the advance of the destruction and save the tooth. When the pulp has been reached, nothing can be done short of extracting the tooth.

Toothache.—Toothache generally depends upon exposure of the nerve by caries of the enamel. It may, however, proceed from the spongy tenderness of the gums which is generally dependent upon the use of mercury, or it may arise from suppuration of the periosteum at the root of the tooth. In the first class of cases, little can be done further than to temporarily relieve the pain by the application of myrica, ulmus, oil of cloves or cinnamon, and similar agents, which are common in household practice. When the mercurial sponginess of the gums is the provoking cause of the ulcer, the mouth may be frequently washed with tannin in solution, or an infusion of any vegetable agents which contain tannin, as oak bark, sumach, etc. When suppuration at the root of the tooth is the cause of the pain, extraction, as in the case of caries, is the only hope of permanent relief. If the pain is endured, however, the case soon becomes one of gum-boil, when it may be lanced and relief obtained. Where the provocation of the decaying tooth is sufficient to cause inflammatory excitement through the face and jaw, or where cold has been the provoking cause of the misery, warm and moist applications may be made externally, as poultices of mush, of ulmus sprinkled with lobelia and capsicum, heated bricks wrapped in cloths moistened with vinegar, etc.

Gum-boil.—Gum-boils, or *paruli,* are small abscesses which usually commence near the socket of the tooth, where they cause much pain, and discharge either through the alveolus or near the crown of the tooth itself. Relief may be obtained by the application of poultices, as mentioned in the last paragraph, and the abscess may be lanced as soon as it points on the surface of the gum.

Extraction of Teeth.—Teeth may be extracted either by forceps, turnkeys or elevators. The forceps are the preferable instrument in nearly all cases, though some dentists still prefer the keys. The forceps should be made firm and with sharp edges, which may be excavated to suit the irregularities of the crown of the tooth. In using them, the gum should be loosened from the tooth, the instrument pressed firmly upon the root and then a steady extracting force applied, a gentle to-and-fro motion being given at the same time. Several sets of forceps are usually required in order to accommodate the different sizes and forms of teeth; and the surgeon must be watchful in using them and not press the handles of the instrument too firmly together, lest he should thereby break the tooth to pieces. The position of different teeth, as well as the manner in which caries has affected them, must determine the position in which the patient is to be placed and the direction of the extracting motion. In the use of the turnkey, the hook is to be placed below the crown of the tooth upon one side while the fulcrum is pressed firmly against the alveolus upon the other. The handle of the instrument being then twisted, the key and fulcrum are brought into a firm position, when still further rotation of the handle, with a lifting motion, will turn the tooth outward—providing it does not break off at its neck. This is a clumsy instrument, at best, and is liable to do much damage to the jaw, besides invariably causing more pain than extraction with the forceps. The elevator is used for stumps. It is managed by pressing the point of the instrument between the tooth and the socket, when, by forcing the handle downward (the alveolus or the operator's fingers being converted into a fulcrum), the tooth may be lifted out.

Very troublesome bleeding sometimes follows the extraction of teeth, baffling most of the hemostatic efforts of the surgeon. The plugging of the recently emptied socket with matico, tannin or gallic acid, affords relief. No material, however, should be squeezed into the tooth with force, but simply passed into the socket with a moderate degree of lightness which will be sufficient to astringe the bleeding vessels without pressing apart the walls of the alveolus. At the same time the feet of the patient should be placed in a vessel of hot water and the hands and legs washed with the same. By thus inviting the blood outward and downward, very severe hemorrhage may be checked, even without the use of any of the astringents. It has been recently recommended to pass a tourniquet around the head and screw the pad over the alveolus of the bleeding socket. The success following this management is reported to be good.

Absorption of the Gums.—This degeneracy, commonly called *scurvy of the gums*, may be known by the spongy, red, exceedingly tender and painful state of the parts. The gums ultimately separate from the teeth, bleeding upon the slightest touch, while the alveoli become absorbed, generally suppurate and become so loosened from the teeth as to allow them to fall out. The difficulty is most commonly caused, remotely, by the use of mercury, but may also be dependent upon the unhealthy condition of the stomach and bowels, with the too free use of salted foods in persons of a scrofulous habit. It is best relieved by unloading the bowels with suitable aperients, putting the patient upon a free vegetable diet, bathing the skin freely and gargling the mouth with diluted pound tincture of myrrh, acetic tincture of capsicum infusion of quercus, cinchona, hydrastis or rhus gla The mouth must be kept pure, the digestive apparatus up and the system supplied with a proper quantity vegetable acids.

CHAPTER XIII.

AFFECTIONS OF THE REGION OF THE NECK.

Affections of the Fauces.

Abscess of the Tonsils.—Congestion of the tonsils is provoked by the contraction of a cold. The gland inflammatory action is provoked in it, much difficu swallowing is experienced, febrile excitement and pain head may follow and an abscess (generally of small size be formed. After the pus has accumulated (which is k by the accession of rigors) the pain in the part is and deglutition almost impeded. The enlargement gland can be plainly seen by the naked eye. Wher tonsils are affected (which is not often the case), the ph becomes almost occluded. The treatment should b directed to the relief of the circulation—a vapor bath given to invite it outward, the neck bathed with lobeli oil of sassafras and the heat of the parts abstracted by ing a small piece of ice in the mouth frequently. I gestion can not be thus relieved, but the tissues proce suppurate, the abscess may be discharged by a small pur with a straight-edged bistoury. Usually, however, it is to allow the material to escape by spontaneous rupture abscess, as the artery of the tonsil may be wounded b knife and dangerous hemorrhage ensue. Relief is p almost as soon as the abscess is emptied. Persons who been thus affected once, are very liable to a return c difficulty upon trifling exposures.

Chronic Enlargement of the Tonsils.—The tonsils some become hypertrophied, leading to difficulty of swallo impeding respiration and articulation and sometimes ca deafness by pressing upon the Eustachian tube. The sw is usually indolent, but inflammatory excitement may be voked. The growth may be absorbed by the continue of the vapor bath, alterants and tonics to purify and i orate the system, when enfeebled, and the external application of the tincture of lobelia. When the persevering use of these means fails, the tonsil knife of Fahnestock may be used to extirpate a portion of the gland. The surgeon may stand behind the patient and place the elliptical ring of the instrument over the apex of the enlargement; the blade of the guillotine may be then shoved forward quickly and steadily. Some surgeons operate by seizing the enlargement with a volsella, drawing it forward and then excising it with a straight-edged bistoury or pair of scissors. Only a small piece of the tonsil is ever required to be removed, and it is but seldom that the difficulty becomes so great as to demand operative interference. Bleeding sometimes becomes troublesome after excision of this gland, and should always be met promptly by suitable astringents.

Elongation of the Uvula.—The uvula may become relaxed or edematous, when it will fall downward against the glottis and provoke a painful cough and lead to a constant disposition to swallow. It is generally relieved by putting some powdered myrica against it; or quercus, gum myrrh or geranium, may be used for the same purpose. When the elongation becomes permanent, the uvula may be drawn forward by a volsella and a small portion of the end of it clipped off with a pair of scissors.

Affections of the Pharynx.

Pharyngeal Abscesses.—Small abscesses may be formed in the pharynx, causing a tense, fluctuating swelling beneath the mucous membrane. They are to be discharged by puncture, a long trochar and canula being used for the purpose, in order to prevent the pus from passing into the larynx, where it might cause suffocation. These abscesses sometimes form in consequence of venereal taints; but more commonly there is an ulceration of the surface supervening upon the absorption of the venereal poison, constituting a very troublesome difficulty. It can seldom be relieved except as the contamination is driven from the system by the constitutional management already directed for secondary syphilis.

Stricture of the Pharynx.—The cicatrization following upon the healing of an ulcer or a large abscess, may contract the pharyngeal opening; or there may be a plastic deposit following inflammatory excitement; or carcinomatous tumors may be developed in those parts, occluding the whole cavity. In either case, the sense of contraction is painful, there is a difficulty of swallowing and the patient is under a constant state of apprehension. Simple constriction may be removed by the passage of a probang and the use of lobelia both internally and externally; malignant growths can only be palliated, cure being impossible.

Foreign Bodies in the Pharynx.—The presence of solids in the pharynx gives rise to a most distressing cough, with pain, spasmodic contraction and a sense of suffocation. They can generally be removed by the finger of the surgeon, the patient being seated in a chair and the cavity of the pharynx examined carefully till the offending material is reached. The operation provokes violent retching, but this is of no consequence and should not deter the procedure of the surgeon. In some instances, where the solid is lodged deeply and near the larynx, a pair of long, curved forceps may be required for its removal. The sensation of the continued presence of the solid is apt to remain for some time after it has been actually removed.

Affections of the Esophagus.

Stricture.—Stricture of the esophagus may result from spasmodic contraction, from the cicatrization following the passage of scalding water, caustics, sulphuric or nitric acids and other materials that may denude the throat of its lining membranes, and from the growth of carcinomatous or other tumors either in or near the track of this tube. The constriction may be very slight, causing mere difficulty in swallowing; or it may be so great as to entirely prevent the act of deglutition. When it depends upon spasmodic contraction of the pharnygeal muscles, it may be relieved by the external use of relaxants, by the inhalation of vapor or by clysters of the tincture of lobelia. When the contraction is the result of cicatrization, little can be done except to avoid the use of solid foods. When the presence of a simple tumor, external to the esophagus, is the cause of the difficulty, its early removal becomes necessary. In carcinomatous developments in the esophagus, nothing can be done except to keep the passage open by the occasional use of the probang, by which means the tube may be dilated from time to time and the food allowed to pass. The strength of the patient must be at the same time sustained by the exhibition of nourishment per rectum. The stricture sometimes becomes permanent from the effusion and organization of plastic material, stiff cartilaginous rings forming at points along the esophagus and causing either a temporary or permanent lodgment of food. The probang usually gives temporary relief, but nourishment by the bowels may be demanded for a series of years.

Foreign Bodies in the Esophagus.—Various solids may, from time to time, become entangled in the esophagus, being usually lodged near the cricoid cartilage and causing a painful sense of choking and ultimately leading to ulceration, which may be fatal. There is always an exhausting cough and dyspnœa, and putrid expectoration is abundant. When the solid is lodged in the pharynx, just against the opening of the esophagus, it may be removed by the fingers of the surgeon; when it has passed further down, it can only be extracted by the use of a pair of long-bladed curved forceps. These should be introduced through the pharynx quickly, yet carefully, and moved about till the position of the offending material has been discovered, when it may be siezed and extracted by moderate force. Indigestible and irritating solids may be removed in this way; but pieces of meat and other food which are soft and can be digested by the stomach, should be pushed down unhesitatingly. When a piece of bone becomes imbeded, by its spiculæ, in the membrane of the esophagus, the patient may be relaxed by lobelia, and mucilage of elm given to drink in large quantities, and vomiting then induced. The offending material is frequently got rid of in this way. When all these means fail, no alternative is left but to practice esophagotomy.

Esophagotomy.—In performing this operation, the patient should be seated in a chair with the head thrown well backward. A probang may be passed down to the obstruction and the offending material pushed forward, so that its position can be more clearly defined. The incision through the integuments should be made directly over the point where the solid is most prominent, the sterno-mastoid muscle being pushed to one side and the esophagus exposed. The outer incision should be made pretty free, while the incision through the esophagus should be as limited as possible. The offending materials having been extracted by the forceps, or the fingers, the wound should be carefully cleansed, then closed in the ordinary mode and food conveyed to the stomach (by a tube passing through the nose and pharynx) till adhesion of the parts has taken place.

Use of the Stomach Pump.—The stomach pump is used in cases of poisoning for the purpose of taking away the deleterious materials that have been introduced. The tube of the instrument is to be passed through the patient's mouth and down to the esophagus, the mouth being held open by pieces of cork, or other suitable material, placed between the teeth. Tepid water should then be thrown into the stomach to the amount of a quart or more, about two-thirds of which may be carefully and steadily withdrawn by the pump. By then introducing more water and repeating the use of the pump, the material that has been swallowed may be diluted and gradually withdrawn from the system. Irritation of the stomach is always provoked by the use of the stomach pump, and it is only in a few fortunate cases that death from poisoning can be averted by this process; prompt vomiting, secured by the third preparation of lobelia and an abundance of the infusion of myrica, mustard or capsicum, will generally supersede the use of this instrument.

Affections of the Larynx and Trachea.

Laryngitis.—Laryngitis, cynanche trachealis, or croup, may lead to suffocation, either by the edema of the glottis, by the excess of fibrinous or plastic exudation, or by the formation of abscesses under the mucous membrane. The difficulty is at all times commenced by an acute febrile action, labored breathing (in which the inspiration is performed by a painful effort and accompanied by a crowing noise) and anxiety of the countenance, with a disposition to throw the head back as the trachea becomes occluded. Children are most commonly affected; and, while the difficulty is at all times serious, it can generally be removed by the prompt and energetic use of lobelia emetics, tincture of lobelia by injection and the vapor bath or the tepid wet sheet pack. With this treatment, however, the medical practitioner has most to do and the surgeon's attention is chiefly directed to the mode of furnishing relief after the larynx has become occluded either by fibrinous exudations or the edema of the glottis. When the patient is in this condition, medication seems of no further avail and laryngotomy may be practiced as a last resort. Against this operation, however, the surgeon should be carefully guarded; for, while relief is thereby generally obtained and life apparently saved, it should only be employed on rare occasions and after it is evident that all other means have failed. The mode of performing the operation will be mentioned presently.

Foreign Bodies in the Larynx.—During the act of inspiration, the glottis is wide open, and it is then quite easy for any solid that may be in the mouth to find its way beyond the rima glottidis. The solid may lodge at this point, being prevented from escaping outward by the contraction of the glottis which its presence immediately provokes. If the solid is of considerable size, respiration may be impeded at once; and it is not uncommon to see the patient turn blue in the face, grasp convulsively at the throat and then drop dead before assistance can be rendered. More frequently, however, the solid passes downward, finding its way into the trachea and lodging at any point between the box of the larynx and the larger bronchi. At times, the material becomes fixed in the ventricles of the larynx, lodging firmly against the walls and provoking very violent cough, a fixed pain in the spot and difficulty of breathing. The cough returns in paroxysms, there is at all times a copious expectoration of mucus, the countenance becomes suffused, there is a painful expression in the face, the head is thrown upward and backward and the small blood vessels soon break down, when the expectoration becomes sanious. The same general symptoms prevail when the solid lies loosely in the trachea, with the addition that the substance may be heard, by the stethoscope, passing up and down in the tube during the fits of coughing. When the body is large, it may be felt by the finger; and the act of coughing sometimes forces it against the larynx, from which it is again drawn backward during inspiration. Small solids only can pass into the bronchi, when a cough of a peculiar whistling character is provoked. The cough is perhaps more exhausting, in this latter class of cases, than in either of the others, though the danger is not so immediately imminent.

Solids lodged in this way, lead to serious results either by immediate suffocation (as has been already remarked in cases where the solid stopped near the glottis), by an accumulation of mucus occluding the passage, by leading to erysipelatous congestion of the lungs or by lodging in the parenchyma of the lungs, there leading either to suppuration or even to tubercular deposits and consumption. This accident may be accompanied with laryngitis, the peculiar whistling or crowing cough sometimes strongly similating the latter affection. Indeed, inflammatory action of the larynx and trachea can scarcely fail to be provoked; and, while the case can not be called one of croup, there is in both instances the same liability to occlusion of the glottis by excessive inflammatory exudations within the larynx. The chief point in diagnosis lies in the history of the two cases, croup coming on slowly and being accompanied with febrile effort, while the symptoms that follow the introduction of solids occur very suddenly and are unaccompanied by fever. In croup, expiration is easy which will be shortly directed for asphyxia. If this fails, tracheotomy will have to be performed.

Ulceration of the Larynx.—The larynx may suffer ulcerative destruction in consequence of congestion produced by the presence of solids; or mercurio-syphilitic contamination may lead to disintegration of the parts, the destruction generally beginning in the fauces and extending to the larynx secondarily. When the larynx is thus affected, there is likely to be an edematous swelling, fibrinous exudation or great contraction during cicatrization of the ulcers after they begin to heal, from either of which causes respiration may be interfered with, and from the first of which (edema) life may be jeoparded.. The treatment is generally of the same constitutional character that has been already directed for secondary syphilis, beyond which little can be done to the parts directly. When life is threatened by edema or fibrinous exudation, tracheotomy must be practiced and a tube worn in the opening either permanently or temporarily, as different cases may require.

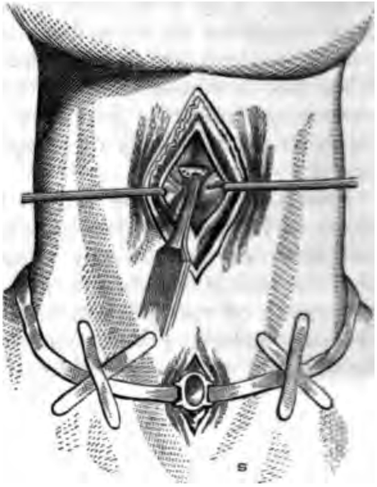
Tumors.—Tumors or polypi occasionally grow within the larynx, or begin their development upon the epiglottis and extend downward upon the rima glottidis. Warts also grow upon the lining membrane of the larynx, and chronic arterial excitement of the trachea sometimes leads to contraction of the tube, occluding it to such an extent as to render breathing difficult and even to jeopardize life. Tumors, warts and polypi in the larynx may provoke edema and prove immediately fatal; more generally, however, they lead to a distressing cough with difficulty of deglutition and, ultimately, dyspnœa is produced. The passage of the probang through the larynx and trachea has been recommended to relieve all this class of difficulties. It is quite improbable, however, that any material benefit can be obtained by this procedure; and little is left to the surgeon but to keep the patient as comfortable as possible till the dyspnœa becomes so great as to demand the operation of tracheotomy.

Laryngotomy and Tracheotomy.

The occasions upon which any portion of the windpipe may need to be opened, have been already mentioned. The operation, in itself, is a simple one, though the circumstances under which it is performed render the success of the procedure a matter of the greatest importance to the patient. The tube is incised either for the purpose of affording temporary relief—as in cases of croup and the lodgment of foreign bodies, after which the wound is closed up and healed over, or with the intention of affording permanent relief—as in cases of tumors and occlusion of the trachea by fibrinous exudations, when a tube is worn in the artificial aperture and no attempt made to heal the wound.

In performing these operations, the circumstances connected with individual cases should be allowed to determine the choice of the point of incision. Laryngotomy is the safer operation of the two and should be performed whenever it seems possible to give relief by an external aperture at this point; but when the difficulty is evidently further down in the windpipe, or when it consists in a permanent occlusion of the box of the larynx or the upper portion of the trachea, the surgeon has no point of election and must of necessity perform tracheotomy. Whichever operation may be chosen, the patient is to be seated upon a chair, his shoulders supported with pillows and the head thrown backward and stretched a little upward. A vertical incision is then to be made in the mesial line through the integuments, between the sterno-thyroid muscles (when the larynx is to be opened) and down to the crico-thyroid membrane. This membrane is then to be severed at right angles to the first incision. The parts having been next separated by blunt hooks, any foreign or offending material is to be removed by a suitable pair of forceps and a curved silver tube then introduced through the opening and retained in its position (as long as requisite) by tapes passing around the neck. There is but little bleeding and the patient seldom suffers inconvenience from the operation. In tracheotomy, the membranes should be incised in the mesial line, as before, the blood vessels being laid aside that they may not be wounded. All the tissues having been divided, the tracheal rings are exposed. The patient, at this moment, is to be directed to swallow and the cartilages are to be incised during the act of deglutition. The extent of the

FIG. 82.



Laryngotomy and Tracheotomy.

wound through the trachea must depend entirely upon circumstances, one, two or three rings being severed, as different cases may require. Great care is to be taken, however, not to injure the thyroid gland, and no blood vessel of any size should be severed if it can be avoided. If the operation has been for the removal of a foreign body, the aperture is to be opened by a pair of broad forceps, when it is quite likely that a cough will be provoked and the offending material expelled. If this does not occur, a pair of very small forceps may be gently introduced and the substance extracted by them. When permanent occlusion of the upper portion of the larynx and trachea has made the necessity for the operation, the opening through the trachea is to be at once filled with a curved silver canula. This should be introduced steadily and carefully, a conically formed tube being first chosen and one of uniform size being inserted after the hemorrhage has ceased. After this operation, the patient should be kept perfectly quiet, the room maintained at a steady temperature and restlessness and agitation relieved by the use of lobelia or nervines in suitable forms.

Alarming hemorrhage sometimes follows this operation. The amount of blood lost is not in itself considerable, but its liability to pass into the trachea and lead to suffocation by engorging the bronchi, demands that every precaution should be taken to avoid such an occurrence. The mere presence of the canula, when promptly inserted, is usually a sufficient hemostatic, closing the bleeding vessels by its pressure. It is seldom necessary to make cold applications externally, and the danger from bleeding may generally be averted by placing the patient upon his side immediately after the operation. The sudden and direct introduction of cold air through the opening, as also the introduction of the canula, commonly provokes a violent fit of coughing; but the patient soon becomes accustomed to them both and seldom suffers much inconvenience except for the first few hours, during which an excess of mucus may occlude the end of the tube and interfere with respiration. This should be cleared away, from time to time, by the surgeon or an assistant. After a few days, the patient suffers no inconvenience from the presence of the tube, which (when worn permanently) is to be fastened about the neck by tapes.

Wounds of the Throat.

Wounds of the throat are generally made with suicidal intentions, are usually situated near the thyroid cartilage, are made in a transverse direction and may become extremely dangerous from the severance of the bloodvessels. The mere severance of the windpipe is not in itself sufficiennt to cause death, a popular belief to the contrary notwithstanding. Ultimately, however, even wounds of this class may become serious in consequence of their suppuration, or by occlusion of the air passages with blood which the patient is too feeble to expectorate.

When either the carotid artery or the jugular vein has been reached, death follows too speedily to allow surgical aid any opportunity to do good; hence the practitioner is seldom called upon to treat any other than those cases in which the cartilaginous rings have been severed and small arteries alone wounded. It becomes his first duty to secure the bleeding vessels by ligating the arteries and applying pressure upon the veins. The patient should be kept in a warm room and may be laid upon his side in order to prevent the blood from passing down the trachea. Generally speaking, it is not well to draw the edges of the wound together, and plasters are at all times inadmissible. A piece of lint may be moistened with water and laid loosely over the part, and a piece of gauze or woolen thrown over the neck. The despondency of mind which usually leads to the rash act of suicide, generally continues; and it is necessary for the attendants to watch the patient closely, not only to prevent him from again wounding himself, but to keep him from meddling with the dressing on his neck. After the lapse of a suitable time, a tube may be inserted into the stomach (being passed by the way of the nostril) and the patient's strength sustained by nourishment introduced through it. If suppuration follows, the position upon the side may be maintained in order to allow the escape of the purulent fluid. If any portion of the membrane should slough away, the putrid masses must be removed early; the bowels must be at all times kept regular and the patient should be surrounded by both cheerfulness and quiet. If respiration becomes difficult, the patient is to be watched with the utmost care; and tracheotomy must be performed and the canula inserted the moment the breathing becomes decidedly laborious. Sometimes, portions of the larynx or trachea are so severed as to hang within the tube, causing serious inconvenience. Such shreds may usually be held in place by a light stitch passed through the cellular tissue. If clots of blood accumulate in the pharynx, they are to be removed by artificial means. If there is a tendency to chronic thickening in the mucous membrane, it may become necessary to perform tracheotomy. While the position of the patient is at all times so regulated as to prevent either blood or pus from trickling into the trachea, care should also be taken to so fix the neck that the edges of the wound may come closely together. The parts always heal very slowly, and several weeks are usually required to repair the wound.

Drowning.

In treating a person who has been drowned, the face and neck should first be bared and the body rubbed dry as quickly as possible. The patient may, at the same time, be turned upon his face, which position allows the tongue to fall forward and leaves the glottis free. He may be then turned on his side, when inspiration will be favored. By thus alternately changing his position from the face to the side, at the same time applying friction around the back, artificial respiration will be established. The propriety of these movements has been recently demonstrated by Marshal Hall; and it is evident that no other means can be so effectually employed for creating natural respiration. The movements should be made steadily and not too quickly, from fifteen to eighteen times in a minute being sufficient. In the meantime, an assistant should be set to work to rub the limbs either with the hands or with stimulating lotions and woolen cloths. The rubbing should be made upward and not downward, and the motion should be brisk and the pressure pretty firm. The nostrils may be irritated either by snuff, hartshorn or titilation by a feather; enemas of the third preparation of lobelia may be given at intervals of from ten to twenty minutes, or capsicum with ulmus may be used in the same way. Electricity may also be employed, but dependence cannot be placed upon it. The motion of the body, with friction, are the means chiefly relied upon; and they must be kept up perseveringly for hours if necessary, success sometimes rewarding the efforts of the surgeon after not less than six, eight or ten hours labor. As soon as the patient begins to breathe, of himself, he will become able to swallow, when small doses of the diluted third preparation of lobelia may be given, and repeated every few minutes till a good draught of it can be taken. Vomiting will be thus induced, when an active circulation will be almost immediately established. The patient must be then kept quiet, placed in a comfortably warm room and the excitement of reaction relieved by the use of an infusion of spearmint, zinziber, asclepias or other suitable relaxants and aromatics. Convalescence is always tedious and the strength will need to be sustained by suitable tonics, generous diet and the best hygienical regulations.

Asphyxia.

Asphyxia is generally managed by artificial respiration. In cases of drowning, this may be performed by turning the patient alternately upon his face and then upon his side, as has been already mentioned. In asphyxia occurring from inhalation of carbonic acid gas, this mode of procedure does not seem to be as effectual as in other cases, and the more common practice is to pass a tube into the larynx through one nostril, closing the mouth and the other nostril, and then filling the lungs through this tube by a pair of bellows. The inflation of the lungs by the bellows should be performed with great care and gentleness, as sudden dilatation will rupture the membranes and lead to serious consequences. When the lungs have been inflated, the nozzle of the bellows may be removed from the tube and pressure made upon the chest to expel the air. The motions of inflation and artificial expiration are to be performed slowly and at the rate of about sixteen movements per minute. The excitement of the case sometimes tempts the surgeon to perform artificial respiration more rapidly, but in so doing he oversteps the limits of nature and may do the patient more harm than good. Under some circumstances, the rima glottidis will become closed and the tube cannot be introduced to the trachea; tracheotomy is then the only resource left to the surgeon, and this must be performed unhesitatingly and artificial respiration established through a canula introduced into the aperture. Many hours of persevering labor may be necessary to re-establish circulation.

Tumors.

Hydrocele.—A cystic tumor of the neck has been described under the name of hydrocele, an expression quite incorrect in itself, but permitted by the authority of custom. It generally consists of an enlargement of the outer coat of the veins, and may be congenital or arise at any period of life. It attains various sizes, seldom reaching beyond that of an orange and being generally not larger than a nut. It is usually globular in form, appears soft and elastic under the touch and fluctuates upon manipulation. There is no pain nor inflammatory excitement connected with it under ordinary circumstances. It generally grows slowly and seldom causes much inconvenience, except when pressing upon important vessels. It may consist of one or several cysts, the contents of which are generally of a sanguinolent character. The membrane of the cyst is generally thin and its superficial position allows tapping to be performed without much trouble or inconvenience. After emptying the sac, the surgeon should endeavor to cause it to granulate from the bottom.

Fibrous Tumors.—Fibrous growths of a very large size are quite common in the region of the neck, being generally superficial, though occasionally covered by the strong cervical fascia. They grow slowly, are not painful and cause no difficulty except their inconvenience and liability to retard the circulation. When it is evident that the tumors are not of a malignant character, it is at all times advisable to excise them early. The mode of removal depends altogether on the situation of the tumor, a crucial or two elliptical incisions being generally proper. The dissection of the tumor should be proceeded with cautiously; the large vessels must always be avoided and small ones ligated before their severance.

Bronchocele.—Bronchocele, goitre, or Derbyshire neck, are terms applied to an enlargement of the thyroid gland. The enlargement is generally a mere hypertrophy, the cells increasing in size and filling with a viscid fluid. Calcareous matter is frequently deposited in these cells, when the tumor becomes hard, though it is more generally soft from the presence of the above mentioned fluid. The whole gland may be involved in the enlargement; or one lobe, both lobes or the isthmus only, may be affected. It presents an unsightly tumor in front of the neck; seldom causes any inconvenience except a little headache and difficulty of breathing when the patient stoops; the skin is usually of its natural color, and there is no pain or inflammatory excitement about the parts. When the enlargement is considerable, breathing and deglutition may be interfered with to a great extent, and constant pressure upon the jugular veins may cause persistent headache and even a semi-apoplectic condition, while a troublesome cough and a deposition of tubercular material in the lungs, may be ultimately provoked. The affection is most common in some parts of Europe, but is occasionally met with in limestone districts in this country. It is a difficulty which seems quite irremediable. Washes and injections of iodine have been recommended for the removal of the tumor, but the success that attends this practice exists more in imagination than in reality. The use of the vapor bath and relaxants, with the design of promoting absorption (see *Hypertrophy*), are the only means upon which any dependence can be placed. The gland is sometimes extirpated, but the operation is a dangerous one and should only be undertaken when the trachea and esophagus are seriously threatened by the enlargement. As this is only likely to occur in aged persons on whom no considerable operation should ever be performed, it is very seldom indeed that the surgeon is justified in attempting the removal of the parts.

Hernia Bronchialis.—This term is applied to small enlargements in the front of the throat, produced by protrusion of the membrane of the larynx through its cartilages. It is a rare difficulty, is generally caused by over exertion of the voice and is amenable to moderate pressure.

Parotid Tumors.—The parotid gland occasionally enlarges, the stroma being usually fibrous, though the tumor is occasionally encysted. The growth is slow; the tumor is generally round, but sometimes presents an irregular surface. It is usually firm in feeling, seldom attaining a size larger than that of an orange and is generally of a simple character, though it is occasionally found to possess the qualities of carcinoma and may rapidly degenerate into fatal cancer. Simple tumors, when small in size, seldom cause any material inconvenience; but when they are much enlarged and are bound down by the superficial fascia, they very commonly extend deeply under the angle of the jaw, involving the blood vessels and nerves, thus impeding the returned circulation from the head, producing dizziness, headache and even coma; and they occasionally press upon the larynx and impede deglutition. When the tumors are of the simple character, they may be extirpated and the patient thus relieved of the difficulty; but when they are malignant, no operative interference is allowable. The diagnosis between the malignant and non-malignant growths at this point is very difficult. When the tumor is moveable, smooth and firm, without presenting the hardness of scirrhous or the pulpiness of encephaloma, it is generally proper to conclude that it is a simple growth and may be excised without danger. In removing these growths, free crucial incisions should be made through the outer integuments and the tumor dissected from below upward. The deep dissection should be performed very carefully lest the carotid artery and portio dura nerve should be injured, an accident which is always serious and which must be avoided whenever possible. Sometimes the artery is engaged in the structure of the growth itself and must then of necessity be severed. It should always be ligated before the knife is applied to it; and indeed the same may be said of all the other arteries of this part, as bleeding is at all times likely to be profuse and the surgeon has to take every precaution to prevent serious loss of blood. The operation is performed for the removal of the tumor alone, and not for the removal of the whole parotid gland.

Torticollis.—Wry neck is a species of deformity analogous to strabismus and clubfoot and dependent upon too great contraction of one of the sterno-mastoid muscles. The difficulty may consist in paralysis of one of the muscles, the other retaining its normal condition; or the muscle of the affected side may be preternaturally and congenitally shortened. In either case, the head is thrown to the side of the shorter muscle. In cases of paralysis, the treatment may consist in friction and stimulating lotions over the relaxed muscles and along the spine. Electricity may also be applied and stimulants and alterants used internally. By persevering in this management, the majority of such cases can be relieved permanently. Where there is but a temporary spasm of one of the muscles, the application of lobelia and the internal use of the same will afford relief. When the displacement of the head becomes permanent and medication gives no relief, the muscle of that side to which the head is thrown must be severed by the tenotomy knife. In performing this operation, the muscle with its integument is to be grasped with the thumb and forefinger and lifted outwardly; the skin is then to be carefully punctured on one side of the insertion of the muscle, near its sternal attachment. The knife is next to be passed under the tendon and close against the bone and the part thus severed. Great caution is necessary lest the vessels under the muscle should be injured. In order to avoid such a contingency, some surgeons sever the integuments with the ordinary tenotomy knife and then introduce a curved blunt-pointed knife with which to complete the severance of the tendon. After the incisions have been completed, the head should be brought to its proper position and maintained there by straps passed about it. Dr. Jorg has introduced a good apparatus for this purpose. It consists in leather corsets for the chest and a band around the head. An iron rod connects the corsets with the band and a ratchet wheel, turned by a key, enables the surgeon to give the head any inclination that he may desire. Operation for wry neck is only suitable when the deformity depends on the contraction of the muscle, though it has been sometimes practiced upon the sound muscle in cases of paralysis of one side.

wash the parts out twice a day. The meatus itself must be at no time crowded with cotton, though a small pledget of lint may be laid in the concha to prevent the accession of cold.

Otitis.

Inflammatory excitement may be provoked in the ear, either external or internal to the membrana tympani, by exposure to cold, the presence of solids and such other accidents and influences as provoke inflammatory action elsewhere. The vital effort, in itself, is not serious; but the offending influences always produce more or less congestion and, if not early removed, will lead to suppuration, under either of which circumstances the suffering will be severe and the function of the ear ultimately destroyed. It is important, therefore, to remove solids when present and to relieve the engorgement of the parts and loosen the tissues both early and promptly. When the pain in the head and throbbing around the ear are considerable, the patient should have a vapor bath applied from the axillæ downward, the bowels should be unloaded by enemas or leptandra, the feet kept warm either by clothing or other suitable means, the head itself kept moderately cool and drinks of asclepias, eupatorium, salvia, asclepias and lobelia, and similar relaxing sudorifics, should be given freely. The ear itself may be syringed with tepid water and the skin may be rubbed with the acetous tincture of capsicum. Sometimes the advance of suppuration and congestion can not be prevented even by these active measures, and the tympanum is destroyed by ulceration and necrosis of the bones may take place. All that can be then done is to attend to the general health in the manner already directed for necrosis and indolent ulcers, keeping the parts cleanly by syringing the ear with tepid water. The function is invariably lost under such circumstances.

Otalgia.

This is a true neuralgia of the ear, the part being filled with the most excruciating and lancinating pains, which occur at irregular intervals and are not attended with any inflammatory excitement. It is generally caused by caries of the teeth and can be removed by extraction of the offending part. The ear may be then treated with occasional injections of lobelia infusion and nervous agitation may be quieted by the use of lobelia pills and small injections of lobelia and ulmus given with the intention of having them retained. bowels demand strict attention and no crude materials s be allowed to remain in the alvine canal.

Abscess of the Mastoid Cells.

Violence over the mastoid process occasionally injur parts so much as to induce suppuration; and childre sometimes afflicted with abscesses at this point withou other apparent cause than that of a strumous diathesis. use of mercurials, particularly in connection with syp taints, may also give rise to the destruction of the bones The difficulty is in all respects analogous to internal abs in other bones, and the student is referred to the section this subject.

Deafness.

Loss of hearing may result from such a variety of c and be distributed in such a variety of characters, th consideration is a question of much intricacy. The po of the auditory apparatus and the removal of its labyrin portions from the sight, frequently render it impossibl the physician to determine wherein the chief source o difficulty lies.

The fault may be in either the external or internal po of the ear—in the former case being commonly withi reach of surgical aid, and in the latter case being often be the influence of medication. The subject is one which as yet, baffled most observers as well as authors. W few give their attention to the ear as a specialty, it mu confessed that a very unsatisfactory degree of light ha been thrown upon the subject. An excellent field of obs tion is here open for the ambitious surgeon or physician; while in this section we purpose giving but a few hint this point, it is to be hoped that some one of the n Physio-Medical practitioners in the country will pay attention to the affections of this region which is nece to the full elucidation of the subject.

In the external ear, deafness may be caused by an acc lation of wax, in which hairs, pieces of wool and co may be imbeded—all serving to obstruct the vibration sound against the tympanum. On the other hand, there be a deficiency of the ceruminous secretion, in which c the external meatus becomes dry and the tympanum lose natural pliancy. The nature of either of these cases will be at once made known by pulling the pinna downward and examining the meatus either with the naked eye or with the aid of a speculum. In the first cases, the material is to be removed either by washing it out with warm water steadily and carefully forced from a large syringe, or by removing the chief portion of the accumulation with an ear scoop and using the syringe afterward. Sometimes the accumulation is so hard that it can not be moved till some oil has been allowed to lie in the ear for a day or two; and it is at all times necessary for the surgeon to take two or three days for the entire cleansing of the channel. When the wax of the ear is deficient, the part may be again washed with tepid water, after which a drop or two of any bland oil, particularly of any of the animal oils, may be dropped into the ear each day. Glycerine, goose oil and the oil of angle worms, are all applicable to these cases.

The membrana tympani itself may be at fault, being either thickened and congested or becoming preternaturally dry; or the membrane may be lost by the progress of ulceration. In these cases, the deafness is not complete. Hypertrophy of the membrane calls for the use of vapor baths and cleanliness of the organ. The hearing may be improved, when the membrane is perforated, by moistening a thin pledget of lint with glycerine and laying it over the aperture.

The internal ear may be at fault, either by organic failure in the auditory nerve or by simple functional derangement of the same; or the bone itself may suffer from suppuration, or the labyrinth of the ear may become obliterated by plastic effusions following fracture of this part of the skull. In the last named case, relief is impossible, and the same may be said in lesion of the auditory nerve. When the function of the nerve alone is the source of the difficulty, the deafness may be more or less complete, but is sometimes amenable to treatment. The general health of the patient must be attended to in those cases, and any determination of blood to the head must be relieved by vapor baths and warm pediluvia. The bowels must be kept regular and the stomach well toned, the impurities of the system in scrofulous cases must be removed by alterants and a vegetable diet, then a very gentle current of electricity may be passed through the ear each day. The current should be so mild as to be scarcely appreciable to the hands of the operator. The use of the battery must be persevered in for months before any appreciable benefit can be hoped for, and the acid battery should be at all times used. Many apparently hopeless cases have been relieved in this way; and Dr. Beck, of Hamburg, O., has reported a case that came under his care, in which, by these means, he entirely restored a gentleman who had been so deaf for sixteen years that the loudest clap of thunder never was heard by him. Unfortunately, however, we have no means of diagnosing between functional derangement and organic lesion, hence the practitioner pursues his course of medication with a sort of blindness, hoping always for the best.

Still another source of deafness is to be found in occlusion of the Eustachian tube. This may be temporarily occluded by nasal polypi or enlargement of the tonsils; congestion and swelling of the fauces will also cause a partial obstruction, while ulceration in the fauces may be followed by cicatrization of this passage, or the existence of inflammatory excitement may lead to plastic effusions in the tube and the access of air to the labyrinth of the auditory apparatus be thus effectually and permanently cut off. It has been recommended, in these cases, to introduce very fine flexible probes into the extremity of the tube for the purpose of gradually dilating it. "The probe, or bougie, about six inches long, and sufficiently curved, is introduced along the floor of the nostril, with the convexity upward; and, just before the pharynx is reached, it is gently turned so as to bring the point outward and a little upward—the mouth of the Eustachian tube being above the level of the floor of the nostrils. If the tube is open, the instrument will be plainly felt entering it. When obstruction or obliteration exists, pressure is to be made where the normal aperture ought to be, in the hope that thus the obstruction may be overcome. Sometimes the operation is at least partially successful. But in too many cases, this as well as the other operations on the Eustachian tube, are found to be not only difficult in performance, but also nugatory in their result" (Miller, p. 241).

CHAPTER XV.

AFFECTIONS AND INJURIES OF THE CHEST.

Emphysema.

EMPHYSEMA signifies an infiltration of air into the cellular tissues of the body, generally resulting from wounds of the lung or some portion of the respiratory apparatus. The whole cellular tissue may be affected in this way, as when fracture of the rib has penetrated the lung; or the region of the neck alone may become emphysematous after a bungling performance of the operation of tracheotomy. Pneümothorax, or infiltration of air into the pleura, very commonly occurs in connection with emphysema. The air is taken into the pleura at each inspiration and from this is forced through the walls of the chest and into the cellular tissue at every expiration, and this process may continue till the whole surface of the body is puffed up. The skin is pale, puffy and emits a crackling sound when pressed upon; respiration is interfered with; the movement of the limbs becomes stiffened when the emphysema is general and death may be ultimately produced by suffocation. The chief management should be of a preventive character, as but little can be done, after the air has once entered the cellular tissue, except to maintain the parts in a quiet position and secure the closure and granulation of the wound as soon as possible. Inflammatory action is almost invariably excited in the lungs by the wound. More danger may be apprehended from congestion and suppuration than from the emphysema. The proper management will be presently mentioned.

Pneumothorax.

In this difficulty, the pleural cavity is filled with air while the lung is disposed to collapse unless emphysema is coexistent. The respiratory movements are distinctly impeded, the patient complains of pain through the chest, the ribs ultimately cease to move at each expiration and percussion at the side gives an unusually clear sound. The difficulty is generally caused by wounds which have extended from without through the pleura to the lungs; or abscess of the lungs may burst in the pleura, when both air and fluid will find their way to the cavity together. By making the patient shake himself and jump up and down, the sound of splashing liquid can be distinctly heard; a sharp tinkling sound is also heard when the patient coughs. The difficulty is generally treated by introducing a very fine trocar and canula into the pleura between the ribs. The space between the fifth and sixth rib is usually chosen for this operation.

Empyema.

This signifies a purulent accumulation in the cavity of the pleura frequently following typhoid pneumonia and wounds. Percussion is dull, the chest enlarges gradually, there is distinct dyspnœa, the patient cannot rest on the sound side, the ribs become separated by the increase of the abscess and there is usually edema of the chest. The respiratory murmur is absent, the lower portions of the chest and the lungs are pressed against the spine, causing distinct misery, interfering with the oxygenation of the blood and sooner or later terminating in death. The pus is to be discharged by an operation with the trocar and canula, the cavity being opened at a rather pendent portion (generally between the fifth and sixth ribs) and the fluid allowed to escape slowly, a part at a time, and great care is to be taken to prevent air entering the cavity as the fluid escapes. For this purpose, steady pressure should be made upward upon the abdomen during the escape of the fluid, and the orifice closed with a pledget of lint. After a sufficient quantity of pus has been withdrawn, the chest may then be bandaged snugly and the operation repeated within twenty-four or twelve hours, as different cases may demand. The strength of the system must be at all times sustained by baths, tonics, diffusible nervines and such other medicaments as the nature of the case demands.

Wounds.

Wounds of the chest are always serious. Where the lung has not been reached, little difficulty need be apprehended and the surgeon has little to do except to arrest the hemorrhage and keep the patient quiet. When the pulmonary parenchyma has been wounded, or when the heart or large arteries have been reached, the cases may become immediately fatal. The great danger is from: *first*, hemorrhage, which generally fills up the cavity of the lung and produces suffocation; or, *second*, suppuration, with exhausting hectic and all the symptoms of phthisis. In treating such injuries, the surgeon must endeavor to remove any solid that has penetrated the parts and lodged in them, after which the patient is to be kept quiet and the hemorrhage stopped as soon as possible. In removing the solids, great care must be taken not to be rude or too persistent in the explorations; for foreign bodies will sometimes be loosened and cast out with the suppuration, while ill-advised probing and the use of the forceps will surely widen the gap in the lungs and lessen the chances for recovery. When the offending material has been removed, the surgeon must keep the system in the best possible condition, allow the patient a generous diet and trust the rest to nature.

CHAPTER XVI.

AFFECTIONS AND INJURIES OF THE SPINE.

Concussion.

The concussion of the spine, like that of the brain, varies greatly in degree, being in some cases a mere jar that leaves no unpleasant symptom further than a sense of fatigue, or at other times may produce immediate death. When the case is severe, the patient usually suffers from the symptoms of shock of injury, becoming pale, cold, more or less insensible, which condition is ultimately followed by the symptoms of reaction, after which the patient complains of great pain through some part of the spine, is either feeble or indisposed to stand and suffers weakness in the lower extremities. The weakness of the extremities may amount to actual paralysis: at times, the sphincters of the bowels and bladder may be relaxed, allowing the involuntary discharge of the feces and leading to the retention of the urine. Inflammatory excitement along the track of the spinal column may be noted, suppuration of the parts may ensue, leading to ultimate death, and (where death is not immediate) blood may be extravasated and the pressure be sufficient to destroy the patient in the course of a few days. Sometimes the spinal cord degenerates or softens slowly, the lower limbs failing, the muscles becoming weak and the movements of the body being irregular. The abdomen becomes distended, the bowels are inactive, the urine is high-colored and voided with difficulty and the muscles of the extremities do not seem to be fully under the control of the will. This condition with its symptoms may follow upon concussion, but it also has its origin in excessive drinking and indulgence in venereal and other bad habits.

Treatment.—The treatment of concussion of the spine may vary according to the severity of the case. Reaction must be induced when the patient suffers from the shock of the injury; and then the sufferer must be put to bed and kept quietly in a recumbent position, the urine must be drawn off by a catheter, inflammatory excitement relieved by suitable relaxants and the contingency of suppuration averted by the free use of lobelia, eupatorium, asclepias and other relaxant sudorifics. The patient's position should be disturbed as little as possible. When extravasation of blood has taken place, or when the bones have been fractured by the violence, or the spinal column compressed, the case may be considered quite beyond the reach of surgery.

Compression.

Compression of the spinal column may be caused by any of the circumstances which produce a similar condition on the substance of the brain, as extravasation of blood, the internal growth of exostosis, fracture or displacement of the vertebræ, the presence of pus, inflammatory exudations, etc. The symptoms are the same as those that have been already described as following fracture of the vertebræ (see page 370). But little can be done in cases of this kind. Dislocation may be reduced, as has been already directed; inflammatory excitement is always to be quieted by the use of the relaxants suitable for inflammatory excitement elsewhere, quiet must be maintained and then the end patiently awaited. Purulent accumulations may find their way outward and be discharged, after which a careful course of diet, depuration and tonics, may restore the health. Exostosis or other tumors within the spinal canal sooner or later produce death by compression; and the same may be said when blood is extravasated as the effect of violence.

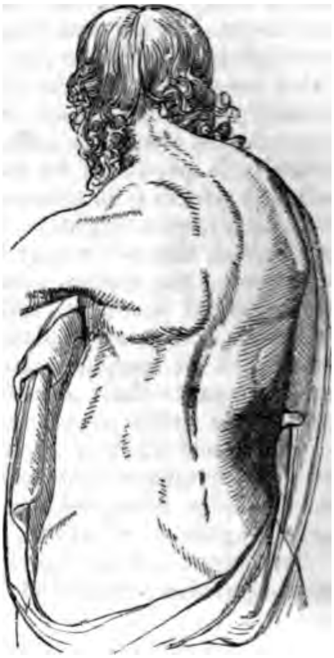
Lateral Curvature.

This affection usually makes its appearance in the early years of life, generally between the ages of twelve and eighteen. Females are most frequently affected with it, though males are sometimes troubled in this way; and persons of a scrofulous diathesis or rickety tendency are peculiarly liable to it. The bones are not particularly affected, but the chief difficulty seems to lie in the ligaments and muscles of the spine. These may be relaxed either in consequence of congenital debility, from that systemic feebleness which follows a system of starvation, or the exhaustion of too long confinement to work in one posture. The whole muscular system suffers at the same time; and the deformity of the spine is immediately provoked by the patient being forced into an awkward position by his avocation, or by the acquisition of bad habits in sitting, standing, etc. Sometimes the curvature begins at the lower part of the column, in the lumbar vertebræ, when the upper portion of the column will be thrown to the opposite side in order to preserve a balance in the trunk. More frequently, however, the curvature begins above, usually appearing between the shoulders about the middle of the dorsel region—the convexity commonly looking toward the right side. The shoulder of the side to which the convexity looks is necessarily raised, while that of the other side will droop. The pelvis is also inclined in the same manner. The changes are at first but slightly noticed, as the difficulty advances gradually; but in the course of time the deformity becomes so great that it is easily recognized when the patient is clothed and becomes very marked when the naked back is examined. When the difficulty is produced by rickets, the bones may be partially affected; and it is in these cases that the deformity is likely to become most unsightly. The height of the patient is always diminished, the pelvis may be contorted out of place so much as to render the motion of the limbs somewhat awkward, and the action of the heart and lungs is sometimes impeded in bad cases. When the deformity begins at an early age, the lungs seek to accommodate themselves by molding the ribs and sternum to their necessities and frequently give a bulging appearance to the breast, sometimes even pushing the spinal column itself slightly backward. Ultimately, the curvature becomes permanent, the patient remaining deformed for life—the difficulty being seldom amenable to treatment after the age of eighteen or twenty.

TREATMENT.—The digestive apparatus must be improved and impurities eliminated from the system, that the blood may be thereby increased in its nutritious qualities and the assimilative apparatus better fitted to nourish all the tissues of the body. Nothing can be done by mechanical means till this point has been attended to. The constitutional treatment may consist in vapor baths, tonics (as hydrastis, populus, celastrus and others), such alterants as smilax, styllingia, rumex and lappa major, leptandra or juglans to regulate the action of the hepatic apparatus, suitable enemas to unload the lower bowels, moderate exercise in the open air, a vegetable diet and the best hygienic regulations. In females, it may also be very necessary to attend to the state of the uterine organs, using macrotrys or aletris when necessary, at the same time giving eupatorium purpureum and mitchella repens when the urine is turbid. Friction along the spine, either with the hand, the flesh brush or a towel, will be found of great avail in increasing the circulation through the muscles and giving them strength. The exercise of the patient should be at no time carried to the point of fatigue. She should be directed to lie upon her back frequently through the day, and the bedding should be at all times hard and the pillows low.

A great variety of mechanical means has been devised for bringing the spine to its natural condition after it has become contorted. The larger proportion of such appliances, in the form of belts and stays, is usually judicious. The practitioner may select those means which, in his own judgment, seem best fitted to particular cases; but care should always be taken never to allow a cumbersome appliance upon the body, not to let the patient wear the instrument all the time and to regulate the mechanical pressure so that it shall be steady while applied yet be at no time so great as to become inconvenient. Months and even years of perseverance are usually required to effect much in these cases, and the practitioner should always be on his guard lest the weariness of the patient should be allowed to induce him to change his mechanical means too frequently. He should also guard the patient against an unnatural position at any time, and teach her to strengthen her own system and muscles, not only by general exercise, but by regular and gentle efforts to bring her spine as nearly into position as possible.

FIG. 84.

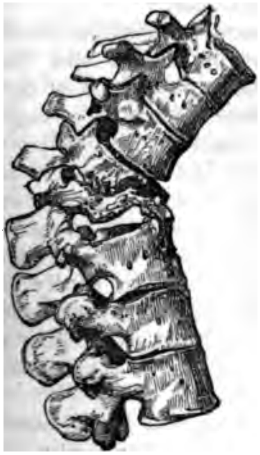


Lateral Curvature of Spine.

Caries—Pott's Curvature.

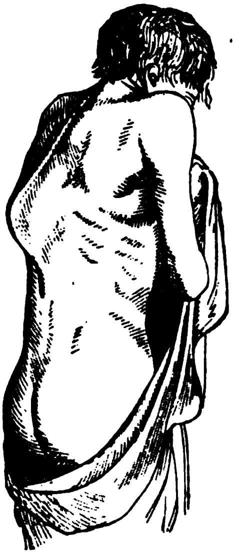
The bodies of the vertebræ are not unfrequently afflicted with caries, those of the lumbar region suffering oftenest and the difficulty usually beginning at an early age and seldom troubling any but those of a markedly scrofulous diathesis. It may, however, be seated at any point in the vertebral column, and adults are not free from it. The patient usually complains of an irritable or weak feeling of the back, is not disposed to stand upright, leans forward and rests his hands upon the thighs, is uneasy, complains of being numb in the limbs, and may be troubled with spasmodic twitchings, costive bowels and pale urine. After a time, the uneasiness in the spine becomes more marked, seldom amounting to a pain but being always extremely tender under pressure or percussion. As the bodies of the bones become softened, the wings and processes project backward, thus forming an angle in the spine more or less acute according to the degree to which the destruction has advanced. At first the curvature is but slight; but ultimately, as two, three or more of the vertebral bodies become implicated, the weight of the trunk presses them down together and the angle becomes decidedly marked. It has been familiarly termed the *anterior* or *Pott's* curvature, and clearly indicates the nature of the difficulty. There may be no discharge of pus upon the external surface, the bodies of the bones crumbling away slowly and the purulent material being either absorbed into the system or disintegration being so inconsiderable as to amount to but little more than the breaking down of the healthy structures. At times, however, the decay is more rapid, especially when the cervical vertebræ are engaged, and abscesses may then form. When the abscess is situated in the cervical region, it may press forward against the pharynx or esophagus and interfere with deglutition, and it usually finds its way outward under the sterno-mastoid muscle and discharges upon the side of the neck. When the suppurative accumulation is in the region of the dorsal vertebræ, the pus may be discharged above Poupart's ligament; or find its way into the sheath of the psoas muscle, pass down under Poupart's ligament and discharge in the thigh; and it has even been known to reach the popliteal space. Mr. Erichsen reports a case in which he opened an abscess at the tendo achillis, in which it was evident that the pus came from disease of the vertebral column. There is no regularity, however, as to the course the pus may take, slight circumstances determining its direction—the abscess discharging in any of the points above

FIG. 85.



Caries of Spine—Macerated bones.

FIG. 86.



Pott's Curvature.

mentioned, or passing into the rectum, through the perin
out by the sciatic notch and occasionally discharging nea
vertebræ themselves. Usually, the abscesses are of very
size, and the quantity of pus discharged is very exhaus
soon leading the patient into a hectic condition.

When the subject is robust and the course of medicati
active, the progress of disintegration may be stayed and
patient recover with a more or less complete anchylosis o
vertebræ. The angular curvature of course remains thr
life, the limbs are always weak and the patient is a cri
both in the back and in the joints of the lower extrem
In more serious cases, the patient may die from suppur
exhaustion, from erosion of the spinal cord itself or from
pression of this cord by sudden displacement of the ca
bones. This latter mode of terminating life is most likel
occur when the difficulty is seated in the cervical verte
Cases of caries in the vertebræ are at all times exceedi
doubtful and the prognosis becomes unfavorable in exact
to the scrofulous tendencies of the patient.

TREATMENT.—When children are affected, the back
be at no time confined by mechanical appliances, but al
left as free as possible, that constitutional irritation may n
provoked by any feeling of restraint along the spinal c
When the cervical vertebræ are the seat of the affection, h
ever, it is well to restrain the motions of the head and gi
support by such appliances as may be deemed advisable.
becomes necessary from the fact that the head is much
likely to lead to displacement of these bones than of
others. The patient should be at all times advised to
the couch—a moderately hard mattress or hydrostatic
being used to lie upon. Voluntary movements should be
terdicted as much as possible and the patient always assi
to turn or change his position in a very gentle and car
manner. The diet should be of a good character, vegeta
being used in abundance and salted and fat meats forbid
The air of the country must then be secured, as no city
tient can ever be expected to recover under these circ
stances. Sea air is at all times beneficial and bracing.
strength of the patient must be sustained by such tonic
are suitable—those of a relaxant nature, as chelone
prunus, being advisable in some cases, populus, leonurus
aletris, being applicable when a moderate degree of stim
tion is needed, and hydrastis, sabbatia and cinchona, be
advisable when more decided stimulation becomes necess
The tonics, however, are seldom required alone, but sho
always be mixed in moderate proportion with the altera

especially with rumex, lappa major, smilax or stillingia. Sirups being made of such articles as these, diuretics may be incorporated with them for the purpose of influencing the kidneys. The alkaline character of the urine calls for the exhibition of such diuretics as the seeds of arctium lappa, which have a peculiar applicability to these cases. At the same time, the system should be bathed regularly with tepid water into which small quantities of salt may be placed. The skin should receive regular attention, not only by baths, but by friction with the hand of an assistant; the bowels must be unloaded regularly by leptandra or enemas, as may be deemed most suitable; cheerful society, free from boisterousness, should be at all times provided; and the tedium of confinement may be relieved by directing the patient's mind to the beauties of nature, thus freeing it from excitement and averting constitutional irritation. If the nerves become very sensitive, they must be soothed and quieted by pills of lobelia and boneset, or by small portions of the weak infusion of asarum, mentha or macrotrys, and rest may be secured by the same means. If an abscess forms, it should not be opened too promptly, and it is advisable to make only a small valvular incision after the pus has actually pointed to the surface; and even then, but a small quantity of the purulent fluid should be drawn off at a time. If the patient falls into a hectic condition, the treatment proper for that condition (see p. 73) should be vigorously pursued. Great prudence and perseverance are necessary in the management of these cases. The surgeon can not hope to effect a cure, and the most that can be done is to check the progress of decay, rid the system of scrofulous impurities, sustain the capacity of the nutritive apparatus and thus indirectly favor the early anchylosis of the bones—the danger both of suppurative exhaustion and of death by the compression of the spinal column depending upon dislocation of the diseased bones.

Lumbar and Psoas Abscess.

Abscesses may form in the lumbar region either in consequence of caries of the vertebræ or of violence done to the soft parts. In the latter cases, the purulent accumulation may take place around the kidneys, near the cœcum or in the iliac fossæ. The disintegration may be rapid and accompanied with intense vital excitement; but the formation of pus more commonly proceeds slowly, there is but little inflammation or pain and the abscess attains an enormous size before it is visible by bulging upon the surface. These cases may be distinguished from lumbar and psoas abscess following caries of the vertebræ, by the absence of spinal tenderness and by the non-existence of any anterior curvature. It is advisable to examine the patient with great care and endeavor to determine whether or not the spinal column is implicated; for if the vertebræ are diseased, the abscess should be opened with great caution (by valvular incision) and its contents evacuated slowly and in small quantities at a time; but if the spine is not affected, the pus may be discharged more promptly and by a freer incision. The anatomical relations of such abscesses, however, demand that great prudence should be at all times exercised in managing them; and the surgeon must carefully sustain the strength of his patient, both before and after discharging the pus, and meet the first symptoms of hectic or constitutional irritation by a most vigorous course of appropriate medication.

An abscess is termed *psoas* when it follows the course of this muscle from the lumbar region to Poupart's ligament or the thigh. It is usually connected with caries of the vertebræ, but may arise wholly in the soft parts. The pus sometimes flows along within the psoas sheath, sometimes outside of it. The diagnosis and management are the same as in lumbar abscess.

Spina Bifida—Hydrorachitis.

This consists in congenital deficiency of one or more of the laminæ and spinous processes of the vertebral column. The position is usually in the lumbar vertebræ, though it is sometimes found in the sacral region, and a few rare cases are reported in which some of the dorsal vertebræ were the parts deficient. The membranes, having lost their bony support, protrude outwardly and form a tumor upon the back, which is usually oval in shape and seldom larger than a small apple. It is usually soft and sometimes even fluctuating. Upon laying the hand on it, the tissues will be found to be tense during expiration and more relaxed during inspiration. Occasionally the fluid that fills this sac distends it to an enormous size. The child is small and appears shrunken and partially paralytic. The tumor generally advances and may burst its cells spontaneously, or by ulceration, when the fluid may be slowly discharged and the parts unite and become consolidated. More frequently, however, the termination is fatal by the ulceration extending along the course of the spinal meninges. The most that can be done for such cases, is to apply very gentle pressure over the tumor, using an air pad and an India rubber band for the purpose. Some surgeons have advised to draw off the fluid by a very fine trocar and canula, a small quantity only being removed at a time. The knife should not be used upon such tumors, neither to puncture them freely nor to excise them. Some surgeons have recommended the latter procedure, but it is of much more than doubtful expediency. The strength of the patient should be at all times kept up and the child should not be moved about nor handled too much. Few of these cases live beyond their second week.

Spinal Irritation.

The meninges of the spinal cord and, apparently, even the spinal column itself, are liable to a peculiar form of irritability, which is always connected with congestion and gives rise to extreme tenderness, if not to actual pain. The symptoms, however, are very various, consisting, sometimes, of numbness or a creeping, tingling feeling over the skin; at other times there may be decided and acute suffering in the course of the nerves, the pain being now intermittent and again permanent. Occasionally the patient suffers from a fixed tenderness in the spinal cord, and there may be sympathetic pain of some internal organ, as dizziness of the head, spasmodic asthma, palpitation of the heart and pain in the stomach and bowels. In a few rare cases, there are tremors, and even cramps, of the extremities; while at all times pressure upon the spinal cord, or upon the sides of the spinous processes, causes intense suffering. This irritation may be confined to a small part of the column or it may extend along the whole track of it; it may appear suddenly and in early life or come on slowly in adult years; it may incommode the patient only during motion or cause constant misery even during the most quiet moments; and the health sinks and the body becomes thin and the digestive apparatus fails under the continuance of the irritation.

More or less tenderness of the spine at all times accompanies caries, abscesses in the lumbar or dorsal regions, and external violence. There may also be a true neuralgia through the cord, under which circumstance there will be pain, but no spinal irritation. The first class of cases will be known by the association of symptoms connected with it; and spinous neuralgia may be distinguished from spinal irritation by the absence of pain when pressure is made upon the processes.

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XVII.

THE ABDOMEN.

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hours from internal hemorrhage, or it may be deferred for a week or more and the patient then sink from the exhaustion of suppuration within the abdominal cavity. This suppuration may be induced as a direct result of the congestion caused by the immediate effect of the violence, when peritoneal inflammation will be always provoked; or it may supervene upon the passage of solids into the abdomen from a rupture of the intestines. In more favorable cases, the patient suffers temporarily from the shock, any internal lesion is healed by due process of nature, extravasated blood is removed by absorption and any pus that may form is discharged through the bowels or upon the skin.

When the liver is ruptured, the patient suffers from shock, the countenance continues pale and anxious, a dull pain is referred to the seat of the injury, and the strength fails from the loss of blood. If the kidneys have suffered in the same way, there is a constant desire to pass water, which is more or less sanious and comes away in dribbles; or the organs may have been so disorganized that all power of secretion fails and neither blood nor urine passes. The bladder may be ruptured and the extravasation of urine lead to speedy death; bloody and continuous vomiting indicates severe injury to the stomach, and a listless state of the mind is at all times alarming.

TREATMENT.—The maintenance of most perfect quiet is one of the leading essentials in managing these cases. Even during the existence of collapse, it is not well to urge medication too earnestly upon the patient; vomiting should be relieved as soon as possible by small doses of a weak infusion of lobelia, and rest and relaxation must be strictly enjoined. Rest is necessary to keep the ruptured surfaces in apposition, thus favoring both the arrest of hemorrhage and the reparation of the injury. The patient should be fed very lightly and the bowels not disturbed for several days, when laceration of the intestinal canal is apprehended. If inflammatory excitement is provoked in the peritoneum, the danger of suppuration, of which it invariably forewarns us, may be averted by the free and constant use of lobelia in small doses and a vapor bath (at a low temperature) if necessary. The ultimate reparation of the injuries must be left entirely to nature.

Wounds.

When wounds of the abdomen penetrate the parietes only, they are to be treated as all ordinary injuries of the same class. When the lesion extends beyond the parietes, but the absence of protrusion of the bowel or extravasation of feces renders it uncertain whether or not the intestines have been cut, the treatment must still continue to be the same as for simple wounds, quiet being enjoined upon the patient, the alvine contents allowed to remain undischarged and arterial excitement (whether local or general) promptly met by the exhibition of lobelia, or lobelia and asclepias. If the external wound is large, the intestine, or a portion of the omentum, may protrude, and yet neither one of these parts be injured. In such cases, the protruding structures are to be gently returned within the cavity (the thighs being flexed upon the abdomen), the external wound brought together by a few uninterrupted stitches and the case managed according to the symptoms that arise. The wound through the parietes may be too narrow to allow the swollen bowel to be returned, when it should be duly enlarged by an upward incision with a probe-pointed bistoury; and the surgeon should always satisfy himself that the protruding portions have been fairly pushed back into the abdomen and not forced under the sheath of the rectus muscle.

When the bowels have been wounded, it becomes absolutely necessary for the surgeon to close the aperture by a few stitches of the glover's suture. When the severed portion of the intestine protrudes, the extent of the difficulty and the attempts to mend it are usually successful at once; but when no portion of the bowel is forced through the opening in the abdominal parietes, the surgeon has no means of knowing the extent of the internal injury except as he notices the extravasation of feces. Whenever this occurs, no time is to be lost in cutting down to the bowels, searching for the wound in them and closing it up by sutures. This procedure is a bold one, but it is the only means of saving the patient's life. The external wound should be made sufficiently large, and the sutures taken in the bowel should be close enough together to prevent the escape of any more fecal matter. The external wound is then to be brought together, the ligatures in the bowel being left to find their way outward through the rectum, which they will ultimately do. Inflammatory excitement and threatening suppuration are to be met by the free and constant use of lobelia and drinks of asclepias, eupatorium or mentha. The patient should be kept perfectly quiet, no purgatives should be given and the food should be light and mainly of a liquid character. It usually takes a week or ten days for adhesion to take place along the wound of the intestine, and this is the critical period in the course of management. Motion and solid food must not, however, be allowed too early, and the closest care should be continued for at least two weeks. The peritoneum is generally threatened with suppuration, ardent peritonitis becoming developed. Lobelia in small doses, vapor baths and relaxing sudorifics, are then to be given, emesis being avoided.

Artificial Anus.

An unnatural fistulous opening may exist between the bowels and the skin, through which the feces pass without being voided by the rectum. It may be congenital, or it may follow upon wounds of the abdomen when the intestines have been severed in such a manner as to allow the feces to escape continually. It may result from abdominal suppuration which reaches from the bowels to the skin, and from the mortification of the intestine in cases of strangulated hernia. Or it may be formed by the surgeon in order to afford relief in cases of imperforate anus. In any of the first mentioned cases, the edges of the wound in the intestine are brought against the abdominal walls and there united by fibrinous exudation. As the union becomes perfect and the feces escape through the artificial anus regularly, a cartilaginous ring forms about the unnatural aperture, the upper portion of the intestine becomes dilated while the lower portion shrinks up, and the mesentery becomes elongated and acts as a sort of valve to the artificial anus, giving a funnel shape to the cavity. Sometimes these fecal fistulæ form without any material difficulty, and the passage of excrement through the unnatural aperture is performed very regularly; at other times, however, inflammatory excitement will be provoked, extensive congestion will take place around the parts, alarming suppuration may ensue, while the ultimate union of the edges is so imperfect that the feces will pass away involuntarily or without restraint. The perforation through the coats of the intestines may be small and a portion of the fecal matter may still be voided through the rectum naturally. Such cases frequently become cured spontaneously, or may be relieved by an operation. When the aperture is large and a peritoneal valve is formed to it, the treatment becomes much more difficult.

TREATMENT.—The first point of treatment must consist in feeding the patient on light food and such as is not solid; the general health must be at the same time sustained, impurities eliminated from the system, relaxants given to quiet the inflammatory excitement, and good plastic exudations thus

**favored. By these means, spontaneous cure may be eff
When it becomes evident, however, that this attempt
fail, the posterior wall of the intestine (which forms itsel
a septum near the artificial opening) is to be got rid
the process of ulceration. This may be effected by gra
the septum in the clamp forceps from day to day; the
lation is thus cut off and ulceration must necessarily super
Inflammatory action is excited around the parts, fibr
materials may be exuded in the neighborhood of the op
and the aperture thus gradually closed. The tighteni
the screws should be proceeded with cautiously, lest the
tum be cut through and the peritoneal cavity left ope
the passage of feces into it, an event that would be spe
followed by death. A circular pad may be slipped ove
blades of the forceps and worn upon the aperture; an
lower extremity of the perforated intestine may be grad
enlarged by the introduction of bougies of increasing
and the rectum itself may be kept from becoming occl
by the same maneuver. After the septum has been
removed and the continuity of the alvine canal re-establi
the lips of the aperture in the abdominal parietes m
shaved away and the edges brought together by sutures,
their union will be favored and the opening thus cured.**

Intussusception.

Intussusception is that rare accident in which one po
of the small intestines gets knotted or inverted into an
portion—the bowel being shoved within itself. The pa
through the alvine canal is so completely occluded, that
feces cannot pass, and pain and arterial excitement are i
riably provoked. The patient may not suffer much incon
ience for a day or two; but as the occlusion of the pa
becomes complete and the feces accumulate above it in
siderable quantities, the distress becomes extremely se
The excrement not finding an exit downward, provoke
persistent fecal vomiting, the patient at the same time be
ing cold and clammy, the countenance shrinking and d
taking place in the midst of great agony. In a few insta
the vomiting occurs at irregular intervals, subsides gradu
the patient becomes comparatively quiet, but is cold and
and death is produced by internal mortification. All ph
are of no avail in these cases, and jalap, gamboge, scamm
and similar agents, seem to have lost all power to unload
bowels. This is to be expected, for all drastic purges are

upon the part through which the bowel escapes: as inguinal, femoral, umbilical, ischiatic, etc. Inguinal hernia, again, may be either direct or oblique, according to the manner in which the bowel has passed the abdominal rings; and the difficulty may be either congenital or induced at any period of life. In the earlier days after the rupture, the bulging tumor can be readily returned to its cavity, when the hernia is said to be reducible; after a time, however, the edges of the opening through which the bowel is protruded become firm and the intestine accommodates itself to the new position to such an extent as to become irreducible; while, in long standing cases, the neck that grasps the sac of the hernia becomes constricted and cuts off the passage of the feces, when the hernia is said to have become strangulated.

A hernia is said to consist of the integuments, or *covering*, with the peritoneal *sac* inside of that and then the visceral contents. From the fact that different portions of the bowels may be protruded from different parts of the abdomen, it necessarily follows that the tumor does not always consist of these parts, in some cases the peritoneum not being protruded in company with the intestine, while sometimes one and sometimes two layers of this membrane will form the sac. And again, the sac may be very thin in some constitutions and thick in others. The part through which the bowel is protruded is spoken of as the *neck* of the sac, which may be large, soft and pliable, or narrow, hard and contracted. The bowel itself is generally protruded in one fold with one fold of the peritoneal sac; but there are instances in which two folds of the peritoneum have escaped, and a large portion of the intestine has also been protruded and formed itself into two or even three irregular plaits.

The causes of hernia may be very various, but the rupture is chiefly brought about by sudden and great strains of the abdominal viscera, by falls and blows upon the abdomen, by heavy lifting or overworking in any way and even by the straining of parturition. But while these are the main *exciting* causes, there generally exists a *predisposing* cause in the form of atrophy of the abdominal parietes. General debility of the frame, either congenital or induced by long spells of sickness, always leaves the walls of the belly thin and feeble, under which circumstances the ordinary motions of stool, severe cough and common gymnastic exercises, may induce protrusion of the bowels. In congenital hernia, there is a deficiency in some portion of the muscular covering of the intestines, through which the bowel escapes readily and even without any material exciting cause.

inconveniently distended with fluid, which may be at intervals of one or more months. Some persons have been tapped as often as twenty times.

Gastrotomy.

In some cases of obstruction of the bowels at their upper portion, whether the obstruction is caused by morbid growths or invagination of the intestine, gastrotomy has been performed, and occasionally with success. It is impossible, however, for the surgeon to diagnose the precise nature of the obstruction or to point out its exact position; the operation, therefore, is usually a blind one under such circumstances. But gastrotomy is also undertaken with a view of supplying nourishment in cases of occlusion in the pharynx or esophagus, and it is sometimes successfully performed for the removal of unwieldy solids that have found their way into the stomach. Among instances of the latter kind, a case has been recently reported in which a physician in Iowa removed a bar of lead, eleven inches long, by gastrotomy. Since the case of Alexis St. Martin has been brought before the profession, it has become evident that the stomach can be opened with comparative impunity; and the practitioner is justified in undertaking this operation in cases that do not seem amenable to any other mode of management. It may be performed by incising the abdominal parietes through the left linea semilunaris, and then examining the intestines and forming an artificial anus with the ileum when the occlusion in them is irremedial, or incising the stomach at such point and in such manner as the nature of individual cases may demand.

CHAPTER XVIII.

HERNIA.

Hernia in General.

The term hernia is applied to the protrusion of any organ through the walls which bound the cavity that contains it: but the expression is now applied exclusively to the protrusion of any of the abdominal viscera. In this sense of the word there are many kinds of hernia, depending entirely upon the part through which the bowel escapes: as inguinal, femoral, umbilical, ischiatic, etc. Inguinal hernia, again, may be either direct or oblique, according to the manner in which the bowel has passed the abdominal rings; and the difficulty may be either congenital or induced at any period of life. In the earlier days after the rupture, the bulging tumor can be readily returned to its cavity, when the hernia is said to be reducible; after a time, however, the edges of the opening through which the bowel is protruded become firm and the intestine accommodates itself to the new position to such an extent as to become irreducible; while, in long standing cases, the neck that grasps the sac of the hernia becomes constricted and cuts off the passage of the feces, when the hernia is said to have become strangulated.

A hernia is said to consist of the integuments, or *covering*, with the peritoneal *sac* inside of that and then the visceral contents. From the fact that different portions of the bowels may be protruded from different parts of the abdomen, it necessarily follows that the tumor does not always consist of these parts, in some cases the peritoneum not being protruded in company with the intestine, while sometimes one and sometimes two layers of this membrane will form the sac. And again, the sac may be very thin in some constitutions and thick in others. The part through which the bowel is protruded is spoken of as the *neck* of the sac, which may be large, soft and pliable, or narrow, hard and contracted. The bowel itself is generally protruded in one fold with one fold of the peritoneal sac; but there are instances in which two folds of the peritoneum have escaped, and a large portion of the intestine has also been protruded and formed itself into two or even three irregular plaits.

The causes of hernia may be very various, but the rupture is chiefly brought about by sudden and great strains of the abdominal viscera, by falls and blows upon the abdomen, by heavy lifting or overworking in any way and even by the straining of parturition. But while these are the main *exciting* causes, there generally exists a *predisposing* cause in the form of atrophy of the abdominal parietes. General debility of the frame, either congenital or induced by long spells of sickness, always leaves the walls of the belly thin and feeble, under which circumstances the ordinary motions of stool, severe cough and common gymnastic exercises, may induce protrusion of the bowels. In congenital hernia, there is a deficiency in some portion of the muscular covering of the intestines, through which the bowel escapes readily and even without any material exciting cause.

The existence of hernia may be suspected when an el
tumor arises rather suddenly in the lower part of the a
men, and along the course of either the inguinal or fen
rings. If this tumor is smooth, globular, has been first no
immediately after severe muscular exercise, is broader b
than above (hanging rather pendulous), emits a gurgling s
when moved, gives a strong impulse when the patient st
up and coughs and can be easily made to disappear int
abdomen when the patient lies upon his back, the case
comes a clear one. Different positions and circumstances
cause slight variations in some of these symptoms; but
are, nevertheless, so uniform that they can be depended u
in the majority of cases. The surgeon should not, howe
be too hasty in pronouncing his diagnosis; for there a
number of tumors that strongly simulate hernia and wl
may be mistaken for it unless the examination is made
scrupulous care. As the question of correct diagnosis is
of great moment in a practical point of view, we will q
the clear and ample language of Prof. Miller upon this p
(Practice of Surgery, p. 387–388):

"1st. *Hydrocele* simulates the oblique inguinal hernia,
is to be distinguished thus: Hydrocele is generally mor
less translucent and hernia is almost always opake—the
ception being when, in a large hernia invested by thin in
ument, a fold of bowel alone descends, capacious and fi
only with gaseous contents. Hydrocele is a constant tun
unaffected by pressure; hernia is ever varying by accide
circumstances and is usually capable of being diminished
pressure, if not made wholly to disappear. The apex of
pyriform swelling, in hydrocele, simulates the neck of her
but, on careful manipulation, it is found to terminate bene
the abdominal outlet, leaving always some part of the c
clear; and the cord is never at any part clear in unredu
hernia. The hydrocele, unless congenital, has no impu
and evinces no tendency to enlargement, on coughing or ot
exertion of the abdominal muscles. The testicle is felt
scurely, if at all, in hydrocele; in scrotal hernia it is usua
found distinct and separate at the lower part of the scrotu
The history of the case, too, is widely different; the hern
tumor proceeds in development from above downward, t
hydrocele is of gradual formation and its progress is fr
below upward. Not unfrequently, however, be it reme
bered, hydrocele and hernia coexist. 2d. *Hydrocele of*
Cord.—This is usually a circumscribed swelling, leaving a p
tion of the cord clear, above and below, as may be ascertain
by manipulation; it is not reducible and it evinces the ordina

negative signs on coughing or other exertion. * * 3d. *Cirsocele.*—Ordinary varix of the spermatic veins and veins of the scrotum can scarcely be mistaken for hernia; the cord is comparatively clear, the feel of the veins is marked and characteristic. Like hernia, there is diminution of the swelling during recumbency and on pressure; but, unlike hernia, there is return of the swelling on resumption of the erect posture and on abdominal exertion, though the thumb be kept accurately and firmly placed on the abdominal outlet. * * 4th. *Bubo.*—The history, progress, form and feel, of bubo must obviously differ very much from those of hernia. * 5th. *Descent of the Testicle.*—The testicle, descending at an unusually late period, may be arrested in the inguinal canal, causing a painful swelling there very similar to hernia. It is known by absence of the testicle in that side of the scrotum, by the feel of the tumor and by the characteristic sensation which is experienced on pressure being made on the part. Like the high form of cirsocele, it may be the precursor of hernia—a portion of bowel or omentum slipping down behind the testicle through the abnormally dilated canal. 6th. *Sarcocele.*—This is readily distinguished by the history and progress of the tumor, its feel and form and its negative signs on coughing. 7th. *Psoas Abscess* is distinguished from femoral hernia by the evidences of spinal disease, by the history of the case, by distinct fluctuation in the swelling and by the progress of 'pointing.' 8th. *Varix of the Femoral Vein.*—A bulging varix of the femoral veins, projecting through the saphenic opening, may very readily be mistaken for femoral hernia. The test is simple. Reduce the swelling by pressure in the recumbent posture and then press firmly on the abdominal outlet; if the case be one of hernia there is no reproduction of tumor, if it be varix the swelling quickly reappears."

Different Conditions of Hernia.

Reducible Hernia.—A hernia is said to be reducible when it can be returned to its cavity in the abdomen by gentle taxis. Such cases are always recent in their formation, the tumor being soft and compressible, disappearing under gentle manipulation, protruding when the patient stands up or coughs, not being tender under pressure and free from inflammatory excitement. The form of the hernia is usually globular and the surface is smooth but occasionally flattened, and it always offers a distinct impulse during the act of coughing and emits a slightly gurgling noise when pressed upon.

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exhalations.

The truss is merely palliative in the treatment of hernia, and it is very seldom that a radical cure can be effected except by a direct surgical operation. Various operations have been devised for this purpose, among the most common of which is the invagination of a fold of the integument. The hernia having been reduced, as before, a smooth conical plug is used to force a portion of the integument inward through the aperture, thus following the course of the bowel as it disappears. This plug may be three-fourths of an inch in diameter at its base and from two to five inches long; rings are attached to its base and the plug strapped in this position by bands passing through these rings and around the body. The design of this procedure is to provoke inflammatory action in the course of the invaginated fold and thus secure plastic exudation and fibrinous adhesions between the parts. Another operation consists in invaginating a fold of the tissue in the same way and then scarifying the edges of the integument and approximating them in such a way that they may grow together.

Still other operators scarify the whole portion of the inverted tissues and then keep the lips of the invaginated fold in position by sutures. Another mode of operating consists in making a puncture through the skin and then scarifying the neck of the hernial sac; pressure is then applied over the aperture and continued till it is supposed that fibrinous organizations have taken place. Of these several procedures, this latter may be considered most safe if due care is taken; but all these operations have the same object in view, namely, the provoking of inflammatory action with the design of closing the opening in the abdominal parietes by securing plastic exudations. Each mode has at times been quite successful; but all of them are very likely to fail and it is advisable for the surgeon not to attempt either of them unless there is reason to believe that the hernia is likely to become irreducible. They of necessity obstruct the capillary circulation and may thus lead to suppuration and even to gangrene.

Irreducible Hernia.—After a hernia has existed for some time and has grown to a large size, a low degree of inflammatory excitement must necessarily be provoked in the parts, fibrinous exudations follow and the sac becomes adherent to its covering; or membranous bands form across it, or the peritoneal fold may become enlarged and dense, thus interfering with the return of the protruded intestine.

Sometimes a large portion of the intestine can be returned, the adhesions existing only between a small portion of the bowel and the sac, thus only partially interfering with reduction. Cases of this kind always cause the patient or less suffering, the size of the tumor becoming deci inconvenient besides always causing dragging pains i abdomen, deranging the stomach, causing pains in the b and even provoking vomiting when the patient attemp stand up after taking a full meal. Trifling circumst may also provoke inflammatory action in these cases, strangulated hernia may be produced by a very ordi amount of labor. The bowels, too, may become par paralized and the feces lodge in them, thus causing vi constipation with colic. In man, the penis and scrotum be buried by the size of the enlargement; and in woman difficulty is greatly increased if she should become preg On these accounts, therefore, cases of irreducible hernia ot be watched with the greatest anxiety; and he is a fort surgeon who never has a case of the kind come unde care or who has managed reducible hernia so as to aver possibility of adhesions.

The treatment in these cases is generally palliative, patient wearing a truss that has a hollow pad, the object ing to sustain the protrusion and prevent its further enl ment. A spring truss may not be applicable to all cases it often becomes necessary to hold up the protrusion by a passing around the neck. The patient must of necessit forced to keep quiet, constipation should not be allowe exist for a single day and the least inflammatory excite in the parts should be promptly met by both general and l relaxation, otherwise congestion may ensue (the vital e being unable to overcome the obstructions) and perito suppuration follow. It is generally best to keep the bo regular by enemas composed of lobelia and ulmus with a small quantity of zinziber. The diet should be rather l and of the vegetable kind, which is most lubricating to alvine canal. If strangulation seems to threaten, the pat becoming restless and the pulse getting excited, thorough laxation must be at once produced, both by enemas and dri of lobelia; and large quantities of ulmus, althea or o demulcents, may be given to drink. Barnsby Cooper recommended that the surgeon should endeavor to conver irreducible hernia into a reducible one. For this purpose, patient is to be kept in bed for a number of weeks, the die to be low, the system is to be kept relaxed by clysters lobelia and a pad of bran, or an air cushion, is to be la over the tumor. Vapor baths may be given to the patien and lappa he lies in the bed, and relaxing alterants (as al major) may be used in sirups. The object of this course management is to loosen the tissues and favor the absorption of plastic exudations. Sometimes surgeons have succeeded, in this way, in getting the parts so far relieved as to be able to return the bowel to the abdomen, when a truss may be worn and the patient cared for as in an ordinary case of reducible hernia.

Strangulated Hernia.—A hernia is said to be strangulated when the passage of the feces is arrested by constriction at the neck, or any other point, of the hernial sac. This constriction may be owing either to the extent of the fibrous growths around the neck of the sac, or to similar thickening of the sub-serous cellular tissue. It is very seldom that hernia becomes strangulated till it has existed for some time, yet there are instances in which the channel of the bowel has been obliterated almost instantly with its first protrusion through the abdominal rings; and while it is most common to persons advanced in life, it has been met with in children but a few days old. The circulation of the part is always more or less directly cut off, congestion ensues and suppuration or gangrene must supervene unless relief is obtained.

While constriction of the sac or its neck is the immediate difficulty in strangulated hernia, it is seldom that the influence of this constriction is felt upon the channel of the bowel unless a new portion of the canal has been obtruded upon some sudden motion or violence. An old hernia may have existed in an irreducible form and no material inconvenience have been felt from it; but suddenly the portion of the bowel in the tumor is shoved downward by the escape of a new portion, and the contents of the sac thus greatly increased at a time when the sac itself has ceased to be expansive in consequence of the cartilaginous formations through it. The inevitable consequence is constriction of the bowel.

The patient at first feels uneasy and has a slight desire to go to stool too frequently; and the hernial tumor attracts an unusual degree of attention to it—not because of any actual pain seated there, but from an indefinable and unpleasant sensation. As the blood becomes gradually congested, a low throbbing pain may be felt, and an inflammatory excitement may be aroused almost instantly upon the protrusion of the bowel and the strangulation of the intestine. In a few rare instances, however, some slight disturbing cause, that is apparently unknown, may provoke engorgement of the vessels connected with the hernial sac and the constriction be caused in this way. The enlargement of the parts, in consequence of their increased vascularity, proves sufficient to strangulate the hernial contents irrespective of the escape of any new portion of the bowels. In either case, however, the uneasiness soon becomes a decided pain. The lower parts of the bowels may be unloaded; but the feces from the upper parts can find no escape and lodge in the folds of the hernia, provoking a still further increase of the pain and a still higher arterial action and indirectly leading to the accumulation of gas. The patient is annoyed by flatulence; the efforts at stool become frequent, but are futile; the tumor gradually becomes more tense and soon presents a feeling of the utmost possible tightness; there is more or less sickness at the stomach, and constant nausea and retching soon follow. The vomiting ultimately becomes stercoraceous; the integuments over the region of the hernial tumor may become purple with congestion; the whole abdomen is tender, pains shooting from the tumor through the whole peritoneum; and the least manipulation of the hernia or change of position on the part of the patient causes a marked increase of the misery. At first the pulse is rapid and hard, but symptoms of constitutional irritation are soon presented and typhoid symptoms then become markedly prominent. In some instances the strangulation is so complete and sudden, that the whole protruded portion of the bowel, with its sac and its surrounding integuments, may mortify within a few hours, when the fecal material will be discharged upon the surface of the abdomen and an artificial anus thus be formed. Where the difficulty does not pursue this course, gangrene soon commences in the contents of the sac, when the pain gradually or even suddenly abates, vomiting ceases, there may be a few slight actions of the bowels and the patient expresses himself as feeling comfortable. Hiccough, however, soon comes on, cold sweats stand out upon the whole body, the countenance is pale and anxious, the pulse sinks rapidly, there may be a little delirium, and death follows in a short time. This train of symptoms may be several days in course of manifestation, but it is altogether more common to have the progress of the difficulty measured by hours and even by minutes. In a few cases, death has appeared to take place almost instantaneously with the strangulation, though this is very uncommon. The surgeon must bear in mind, however, that scarcely any other difficulty is liable to prove fatal more quickly, and that no precious moments are to be lost—whatever is to be done being demanded immediately.

TREATMENT.—The first efforts of the surgeon should be directed toward returning the bowel to the cavity of the abdomen; and operative procedure may be entered upon after this attempt has signally failed. The tumor itself should be handled as little as possible, but the patient is to be placed upon his back, the thighs flexed upon the abdomen in order to relax the muscles, and an injection of a large quantity of lobelia seeds (in a small quantity of elm and tepid water) is to be administered immediately. There are very few cases in which from a quarter to half an ounce of seeds administered in this way will not prove sufficient to relax the patient within from ten to twenty minutes. When there is no vomiting, a large draught of strong lobelia infusion may be given at the same time; but where there is vomiting, a few small doses of weak infusion are to be administered at short intervals till the stomach becomes sufficiently relaxed to receive a full draught. The patient may be at the same time placed in a warm bath, or a vapor bath at a low temperature may be administered to him as he lies upon the bed. By these means, the most complete degree of relaxation is secured in a short space of time. When it has become evident that the patient is so completely under the influence of lobelia that he cannot raise a finger or even move his tongue to speak, the reduction of the tumor is to be attempted. To manipulate upon the part sooner than this, is to aggravate the suffering and increase the swelling; hence, although the symptoms are undoubtedly alarming, they should urge the surgeon to be more thorough with the use of his lobelia rather than to be too hasty in the employment of taxis.

In now attempting the reduction of the tumor, the neck of the sac is to be surrounded by the thumb and fingers of one hand while gentle pressure upon the body of the hernia is being made with the other hand. The fingers of the first hand should be worked continually that the bowel may be freed from the edges of the neck of the sac and the intestinal contents of the hernia not invaginated upon themselves by too sudden and direct pressure over the fundus of the tumor. The manipulations should be made expertly, yet gently; and the degree of force applied should be particularly light if the hernial contents were in a state of tension when the surgeon was called. The profound relaxation caused by the lobelia so greatly favors the process of taxis—not only by loosening the tissues of the neck of the sac and the walls of the abdomen, but also by relieving the tension of the strangulated intestine itself and rendering the patient almost unconscious of pain—that the surgeon is very frequently successful in his undertaking to restore the protruded bowel. When he has accomplished this end, the influence of the lobelia is to be allowed to pass off gradually; the patient is to be kept quiet and in the recumbent posture; a large sized pad is to be bound over the region of the recent protrusion and the bowels may (in due time) be unloaded by a suitable enema. In some cases, however, the strangulation will have been so complete, or the amount of the protruded bowel so great, or the adhesions between the sac and its contents so firm, or the process of decomposition have advanced so far before the surgeon was called, that no attempts at taxis, however judiciously made, can possibly be successful. In the latter class of cases—that is, where there are decided evidences of gangrene—the return of the bowel must not be attempted, the exposure of the parts and the formation of an artificial anus being then the only judicious procedure. When attempts at reduction fail in the other cases, the only alternative left to the surgeon is to lay open the sac, remove the points of constriction by the knife and then return the bowel through the enlarged aperture. This operation is always to be dreaded and should only be practiced as a dernier resort; yet the rapidity with which these cases proceed and the certainty with which they will prove fatal unless relief is obtained in a short time, do not allow the surgeon to spend any precious moments in doubtful reflection. The patient must be kept under the influence of lobelia and the operation proceeded with at once, it being seldom that the procedure will prove successful if delayed for more than forty-eight hours after the accession of the strangulation.

The operation for strangulated hernia consists in laying open the sac and its contents, then removing the stricture by a suitable incision and returning the protruded bowel to the cavity of the abdomen. The direction of the external incision depends upon the position and form of particular herniæ, as will be mentioned in coming sections. It should be performed by placing the patient upon a table, emptying the bladder, removing all bands and pressure from the body, and then pinching up the skin and incising it smoothly, but carefully, with a scalpel. The incision should be pretty free and the dissection through the fat and fascia is to be proceeded with carefully, layer after layer of the integuments being lifted in succession by the forceps, or tenaculum, and then incised. Small arteries are to be ligated as soon as severed. The hernial sac may be known by its fibrous character and tense feeling and by the arborescent arrangement of the circulation upon its surface. The student must make himself familiar with these things in the dissecting room, and also be on his guard when operating upon the living subject, otherwise his ignorance or rashness may lead him into serious difficulties when he attempts the performance of this operation.

The sac having been reached, it is to be pinched up between the fingers, that the surgeon may thus satisfy himself of the safety of the bowel from the edge of his knife. A small opening is then to be made through it with the scalpel, the point of incision chosen being that under which there is a small portion of cellular tissue, or as near the fundus of the hernia as may be considered convenient. The opening need not be large, but should be just sufficient to allow the surgeon to introduce his forefinger through it and reach the edge of the sac without being in any danger of tearing the peritoneum. The finger should be then carefully pushed along between the sac and its contents and the points of stricture examined. The finger is then to be wormed gently under the stricture and the bowel properly displaced from the edge of it; when a curved bistoury, with a blunt point and a short cutting edge, may be pushed flatly along the finger till it reaches the stricture. During this procedure, the bulk of the intestines should be protected from the knife by interposing the back of the hand between it and them. When the point of the blade has reached the stricture, the cutting edge is to be turned upward and an incision, of about an eighth or a quarter of an inch long, made through the tightened part. This incision must be made at that point which is most likely to escape the blood vessels in particular cases, and the greatest care must be taken to not use the cutting edge of the knife at all till the bowels are entirely freed from the part to be incised. The knife and finger may then be withdrawn together and the condition of the bowel examined. If the intestine is very deeply congested and presents spots of dark purple, inclining to green, it is worse than useless to attempt to return it to the abdomen, as abdominal mortification must inevitably ensue under such circumstances, when the result will be fatal. No alternative is left to the surgeon but to let the bowel remain in its position, either allowing it to slough spontaneously or hastening the formation of an artificial anus by removing the gangrenous portions with his knife. This latter course is the better one, as the feces are thereby removed from the bowel at an early hour and constitutional depression and irritation averted. But when it is apparent that the bowel is simply congested, without being in any danger of gangrene, the protruding portion is to be returned to the abdomen by gentle manipulation. It is not proper for the surgeon to push the mass of the tumor back by making pressure upon its fundus, as he may thereby return the whole bowel with its sac still constricting it and the strangulation continue to exist within the abdomen. The forefinger of one hand is to be inserted through the aperture that has been made in the sac and the bowel gradually returned, beginning at that which is nearest the stricture and closest to the abdo The manipulation should be proceeded with carefully a little violence as possible done to the parts.

After the hernia has been reduced in this way, the pa should be put to bed and kept perfectly quiet; and a few of lobelia and boneset may be administered to quiet ne agitation and an infusion of mentha, lavendula, or other and very diffusive relaxants, may be used when drink is c for. Food need not be given, nor enemas used to move bowels, till twenty-four hours have elapsed. If, howeve bowels move spontaneously within this time, the patient take light nourishment; if they still remain occluded, a lo injection may be given. No purgatives whatever shoul administered for a number of days after the operation. or less febrile excitement, with a tendency to peritoneal puration, either of a sthenic or erysipelatous form, is liab ensue in a few days.

It is advisable, therefore, to exhibit lobelia in small qu ties from the first, in order to obviate the contingenc suppuration. When the pulse is hard, small and wiry, a tendency to sordes upon the tongue and dull pains thr the abdomen, such drinks as polemonium, zinziber, ascle and serpentaria, or eupatorium, are to be given in conne with the lobelia. When the pulse is large and hard, restlessness of the system and sharp lancinating pains thr the abdomen, the stimulants are not required in any f but the tissues are to be relaxed by the use of asclepias, r tha and lobelia in large quantities. Under judicious n agement of this kind, it is indeed seldom that any supp tion will take place. The external edges of the wound, h ever, will not heal by the first intention, and there will alw be some purulent discharge from them. In bringing t together, therefore, the surgeon should take but one or sutures, placing adhesive strips between the sutures, not volving the peritoneum in the ligatures and leaving the n pendent portion of the aperture entirely free that the may escape and not be forced back into the hernial sac.

During the performance of the operation for strangul hernia, the intestine may be wounded, either while the sa being cut down upon or at the moment of severing the st ture. The latter accident is most likely to happen and be avoided only by the most scrupulous care on the part the surgeon. The best operators of Europe have someti met with this mishap. The incision should be treated applying a fine silk suture. When the cut is very small in s it may be pinched up with the forceps and a silk ligature tied directly around the parts.

Another accident in performing this operation, is that of wounding the arteries during the incision of the stricture. By carefully considering the anatomical relations of the parts, the arteries can usually be avoided; but as the position of the blood vessels is not exactly the same in all cases, diverging a line or two either way, they may be injured even when the greatest care is taken. The bleeding is likely to be considerable and death not unfrequently takes place. The first precaution, in view of the possibility of such an accident, consists in using a knife that is sharp enough to cut the stricture, but not keen enough to wound the more elastic structure of the arteries. After the vessel has been severed, the degree of relaxation under which the patient has been kept usually diminishes the contractile force of the artery and the momentum of the sanguinous fluid, by which means spontaneous arrest of the hemorrhage is favored. Sometimes the hernial sac sloughs after the tumor has been reduced. This accident is a highly serious one; and when it occurs, the surgeon has no alternative but to make a free way of escape for the pus by undoing the sutures in the external aperture and then invigorating the system by diffusively stimulating and relaxing drinks. Emetics, however, must not be given under any circumstances or at any time (whether before or after the operation) in cases of strangulated hernia.

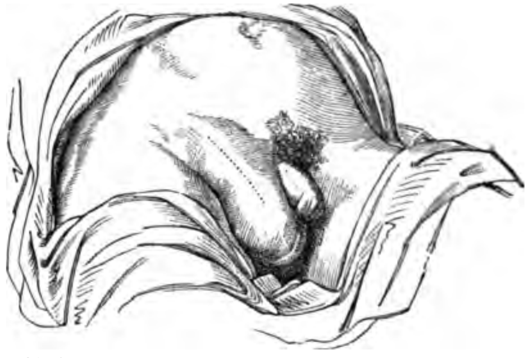
Inguinal Hernia.

The protrusion of the bowel through the abdominal rings and along the course of the spermatic cord, or into the labii, is the most common form of hernia, occurring almost wholly in males and either being congenital or arising during any period of adult life. It is divided into the oblique and direct varieties. The oblique variety is most common and is thus classed from the fact of the bowel passing through both of the abdominal rings and following the course of the testicle to the scrotum or passing over the pubis to the labium. In the direct variety, the protrusion is through the external abdominal ring only, the conjoined tendon of the internal oblique and transversalis muscles being burst through by the bowel, which seldom descends into the scrotum. The oblique variety commences with a fullness over the side of the internal abdominal ring, a little above Poupart's ligament. As it projects through the external ring and finds its way to the scrotum of the male or the labium of the female, it pushes the cremaster muscle before it, leaving the bulk of the spermatic cord behind. In some recent cases, however, the spermatic cord is divided so that the vas deferens and spermatic artery may lie in front, or to either side, of the hernial tumor. The epigastric artery lies internal to the hernia in the oblique variety and external to it in the direct variety. The oblique variety attains much the larger size and is most likely to become strangulated. There may be coetaneous rupture at each of the abdominal rings, one tumor being usually oblique and the other direct; though both of them may be oblique or both direct.

Diagnosis of this variety of hernia from cases of hydrocele and varicocele, as well as from bubo, has been already pointed out (see page 582). The truss that is worn in these cases should have its pad press directly over the internal abdominal ring and not upon the external ring. This precaution is rendered necessary by the anatomical relation of the parts; for if the pad is applied to, or slips down upon, the external ring, the hernia has no direct means of support, will pass through the external ring when the patient stands erect and may there be strangulated.

The operative procedure in cases of strangulated inguinal hernia, is to be commenced by a straight incision over the tumor and in the direction of the spermatic cord. The stricture is generally found at the neck, but may be at the external ring or, more rarely, at the internal ring. The finger is to be pushed along carefully till the point of the stricture is positively reached. The parts of the spermatic cord are to be pushed out of harm's way when they lie in front of the tumor and the offending point is to be severed by an upward in-

FIG. 87.



Plan of incision in the operation for Strangulated Oblique Inguinal Hernia.

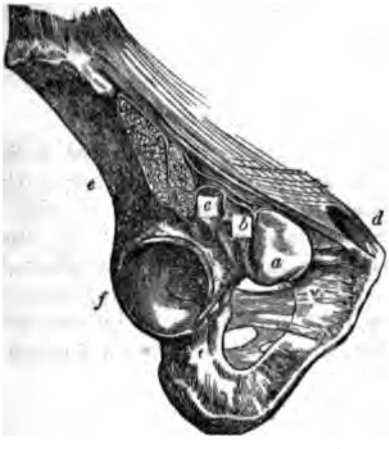
cision, which is directed slightly outward in order to escape the artery. The stricture at the external ring may be severed and one at the same time exist at the internal ring. This state of things is very rare; but the surgeon should be very careful not to return the bowel till he has satisfied himself on this point and made an incision at the internal passage, if necessary.

Congenital Hernia is usually of the oblique inguinal variety and depends upon an imperfect development of the parts. It sometimes does not take place till after the child has been born for several days; but more commonly the bowel protrudes, and follows the course of the testicle, as soon as the child cries. The tunica vaginalis 'forms the only sac in these cases, the testicle lies at the lower part of the scrotum, serous infiltration is likely to take place and strangulation is liable to occur at any time. The treatment is to be the same as in other cases of this variety of hernia.

Femoral Hernia.

This variety of rupture most commonly occurs in females; and it is also known as the *crural* hernia from the fact that the bowel protrudes through the crural aperture. This ring, is surrounded by Gimbernat's ligament on the inside, the femoral vein on the outside, Poupart's ligament above and the bone behind. In passing downward, the bowel first protrudes through the crural ring and is then pressed downward behind the falciform process of the fascia lata. As it traverses the crural canal, it may run downward upon the thigh over the pectineus muscle and be covered by the fascia without proceeding any further; or if it passes the saphenous opening in the fascia, it turns upward over the falciform process and lies directly in front of Poupart's ligament. The course of the bowel, in these cases, must be carefully studied by the surgeon before

Fig. 88.

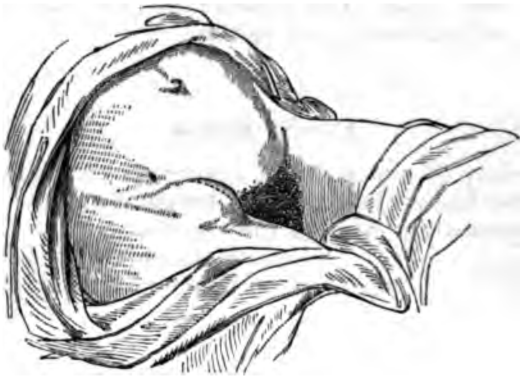


Plan of Femoral Hernia.—*a.* The Sac. *b.* The Femoral Vein. *c.* The Artery. *d.* The Abdominal Ring. *e.* Section of the Psoas and Iliacus Muscles. *f.* The Acetabulum.—Druitt.

undertaking taxis; for instead of attempting to push the bowel directly inward, it must be first pressed downward, turned back under the falciform process of the fascia and then pushed upward through the crural canal. The pad that is worn in these cases should be applied directly over the crural opening in such a manner as to pass below the spinous process of the pubes, to do which it will require to be bent downward and inward at an angle with its spring.

Strangulation is very likely to occur in these cases of hernia, the stricture being either in the crural ring or at the saphenous aperture in the fascia. In operating for strangulation, a direct incision is to be made over the fundus of the tumor in a line with Poupart's ligament and a little below it. This is to be met by another incision carried perpendicularly over the hernia. The superficial integuments are to be dissected with the greatest possible care and the sac is to be punctured with scrupulous nicety. Before proceeding to search for the stricture, the bowels should be drawn downward a little by the hands of the surgeon, when the finger may be introduced through the aperture in the sac and the necessary exploration made. The constriction having been found, it is to be severed by an upward incision, great care being taken to avoid wounding the obturator artery.

FIG. 89.



Direction of the first incision in the operation for Strangulated Femoral Hernia.

Umbilical Hernia—Exomphalus.

This variety of rupture occurs to children almost wholly, the bowel protruding a little to one side of the umbilicus in consequence of thinness or deficiency of the abdominal muscles at that point. The protrusion is caused immediately by the act of crying; the tumor is soft and seldom larger than a good sized button. The hernia is readily reducible and the bowel may be retained within the abdomen by strips of adhesive plaster passed around the belly with moderate tightness; or a pad may be bound upon the aperture with a suitable bandage. Strangulation seldom occurs in children and the protrusion of the bowel may continue to adult life, the tumor becoming gradually larger and more irreducible. As life advances, however, the liability to strangulation increases. When this accident occurs, taxis is to be attempted in the ordinary way and an operation performed when this fails. The external incision need not be large; it is to be made parallel to the linea alba. The stricture is to be removed by an incision in the same direction.

Other Varieties of Hernia.

Ventral Hernia signifies the protrusion of the bowels at any point upon the abdomen, except at the inguinal and femoral rings and at the navel. The tumor generally appears at some point along the linea alba, yet the abdominal parietes occasionally give way at various sites, as in the hypochondriac, iliac and lumbar regions. Ventral herniæ in the linea alba are commonly developed during parturition and attain an enormous size. They are covered by few or no fascia, and are amenable to the ordinary treatment.

Perineal Herniæ have been met with, and so have *vaginal* and *pudendal* protrusions of the bowels. Such cases are extremely rare, yet the surgeon must be prepared to distinguish them from other enlargements. Their several names are distinctive of the positions in which they are found; and they are to be diagnosed mainly by the impulse they offer when the patient coughs. They seldom become strangulated and are not often accessible to retention by pads.

Obturator Hernia has been known to occur, the bowel protruding through the obturator ligament by the side of the obturator artery and nerve. It is very seldom indeed that the tumor can be detected during life, though the existence of a hernia at this point may be suspected when the patient suffers the ordinary symptoms of strangulation without any appearance of an intestinal protrusion elsewhere. Yet these symptoms may arise from, or be attributed to, invagination of the bowel; hence little can be said further than to record the fact that such ruptures are possible.

Diaphragmatic Hernia.—Wounds, or congenital deficiency, of the diaphragm may allow the escape of the colon, or the stomach and omentum, into the cavity of the thorax. They are usually small, seldom inclined to strangulation and can not be detected till after death.

CHAPTER XIX.

AFFECTIONS OF THE REGION OF THE ANUS.

Imperforate Anus.

THE anus is sometimes closed either by congenital contraction of the rectum, by the presence of a membranous septum across the extremity of the bowel or by an occlusion of the rectum an inch or more internally from the anus. When the membranous septum is situated externally, it is usually very thin and the channel of the bowel is completely shut off. When the imperforation depends upon contraction of the intestine, or upon an internal membranous growth, the obstruction may be thick and extend to a distance of several lines, but it usually has a small opening through it. In either case, however, the passage of the feces is impossible. The meconeum accumulates at the point of occlusion and the life of the child will be endangered.

The constriction is to be removed by severing the membrane with a few touches of the bistoury and then keeping the parts distended by interposing a small pledget of lint or any other material that will prevent adhesion of the wound. When the external membranous septum is thick, the position of the bowel is not always readily detected. Under these circumstances, the surgeon will need to wait a couple of days till the *cul de sac* formed in the rectum is considerably distended by the accumulation of meconeum. By then making pressure upon the epigastric region, he will soon be able to define the position of the bowel, when he will have a suitable guide in making his incisions. When the septum is deeply seated internal to the anus, the existence of occlusion may not be suspected till several days have elapsed. An exploration may be attempted with the fingers; but if the stricture is situated so far from the anus that it can not be reached, little can be done toward giving the child relief. The excrement accumulates, the child becomes irritable and restless and soon sinks and dies. The bowel sometimes diverges from its course and opens into the vagina or urethra. Such cases are incurable. In a few instances the intestine terminates at the colon.

Stricture of the Rectum.

Stricture of the rectum may occur, in adults, either in consequence of spasmodic contraction of the sphincter or as the result of chronic thickening of the mucous membrane of the intestine. The latter class of cases is most common. Dense cartilaginous rings form at distances varying from one-half an inch to two inches from the anus, where the feces become wholly or partially obstructed in their passage. The difficulty usually seems dependent upon some injury to the parts; and those tradesmen who are compelled to sit upon hard seats most of the time are subject to it. It may also follow as a sequence of piles, and we knew one instance in which the operation of lithotomy upon a boy led to partial stricture of the bowel in the form of plastic exudations following upon an unfortunate rectal incision. When the passage of the feces is but partially occluded, the patient may suffer but little difficulty if he will pay attention to the state of his bowels and not allow the excrement to accumulate. When the occlusion is nearly complete, however, the feces are strongly disposed to become dry in consequence of the inflammatory excitement provoked in the colon. They can be voided only with the greatest difficulty and in small quantities. Their accumulation in the bowel gives rise to pain, irritation of the bladder, cramps in the legs, headache, dyspepsia, pain in the back, etc.; and, when the occlusion is allowed to remain unremoved, they may lead to ulceration of the bowel and ultimate death.

TREATMENT.—In cases of spasmodic stricture, a few doses of lobelia will generally overcome the difficulty in a few hours. Warm sitz baths, however, may be added. The food of the patient should be light and mostly vegetable, and soothing enemas may be used to further the passage of the feces and keep the intestine relaxed and lubricated. When the stricture becomes permanent, the first care should be to place the patient upon those kinds of food which are unirritating and favor the formation of soft feces. The depurative action of the skin should be favored by daily tepid baths and an occasional vapor bath; irritation is to be quieted by the use of mentha, asarum, polemoneum or zinziber; and relaxation is to be secured by the daily use of lobelia in the form of pills. By these means the bowels will be kept free from excitement

and absorption of the plastic depositions favored. M
weeks of such treatment are usually required to effect r
for the patient—enemas of lobelia and ulmus being use
the meantime, to secure the regular evacuation of the bo
It has been recommended to use bougies in these cases
the idea of dilating the canal. Such a practice, how
cannot be too strongly condemned, as the mechanical p
ure necessary for the introduction of any such material n
sarily provokes inflammatory excitement and favors fur
deposition rather than absorption. In some instances, h
ever, when the cartilaginous rings are very thick and fir
straight bistoury may be introduced to the bowel and
surface of the stricture nicked in a few places in orde
break up the rigidity of the contracted part. Even this
cedure, however, should be determined upon only in se
cases; and the treatment by relaxation and depura
through the skin is to be relied upon, and will usually p
successful.

Carcinoma of the Rectum.

The lower bowel is occasionally obstructed by cancer
enlargements, which generally occur in the form of infil
tion through the wall of the gut, but may appear as a ca
flower excrescence, of a scirrhous character, along the sur
of the mucous membrane. The situation of this difficult
generally four or five inches from the anus, from whic
may extend upward into the colon. It causes a great se
of weight, together with a sense of burning heat, passing
ward through the colon and downward through the thig
The passage of the feces is very much occluded and th
voidance always causes excruciating pain. On this accou
the stools are delayed as long as is possible; the nervous s
tem becomes greatly agitated, sleep and digestion are impai
and the patient sinks rapidly and suffers great depression
mind. Examination per rectum usually detects the scirrho
mass in the form of irregular nodules. Treatment can or
be palliative, being mainly constitutional, as has been alrea
recommended for cancer in general. The patient's life c
seldom be saved longer than a few months, though it has be
recommended to form an artificial anus in the left lumb
region with an idea of still further prolonging existen
Abscesses frequently form near the rectum in connection wi
these enlargements, and thus add to the patient's misery. Tl
nature of the tumor may be known by the hard edges a
fungative center it presents to the finger. The discharge

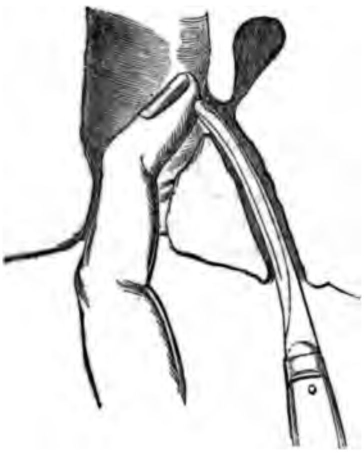
characteristically foul. Warts and condylomata near the anus have been treated of in the chapter upon *Venereal.*

Abscesses near the Rectum.

The areolar tissue, either in the perineum or near the nates, may become the seat of abscesses. Sometimes these are situated quite near the surface, when they will point early and discharge easily; occasionally, however, they are situated very deeply and near to the bowel, when they will always be accompanied with much pain in the parts, inflammatory excitement and constitutional disturbance. The accumulation of pus is generally considerable, causing the wall of the bowel to bulge inwardly and thus becoming a temporary obstruction to the passage of feces. The thickness of the tissues keeps the abscess from discharging early and there is a pretty strong tendency in the pus to find its way toward the rectum. As soon as the accumulation of fluid is detected, a free and deep incision should be made in order to secure the early discharge of the material and avert the probability of an anal fistula.

When these abscesses are situated in the perineum, they are not uncommonly of syphilitic origin, though they may also result from accumulation of feces in the rectum caused either by stricture, occlusion or the presence of cancerous tumors, polypi or hemorrhoids. The inflammatory excitement always partakes of the erysipelatous character, the loose structure of the parts and the nearness of the depressing influence of the feces weakening the blood vessels and favoring extensive congestion. Such abscesses, therefore, are not often very painful, but usually attain a great size, and that even before the surgeon is aware of their existence. The patient complains of tenderness and a sense of dragging or falling in the parts, the bladder is more or less irritable, the scrotum and testicles contracted and painful, the appetite fails and the patient feels unaccountably feeble. The parts present a dull red appearance and feel soft and spongy. There is a strong probability of the formation of urinal or anal fistulæ, in such cases, and the constitution not unfrequently becomes so much enfeebled that a decided tubercular tendency is developed in apparently healthy patients; and the cavity of the abscess is at all times very slow in healing up, even after the pus has been discharged. Like all other abscesses, they should be opened early and the circulation must be aroused and sustained by the free use of emetics, tonics, stimulating infusions and vapor baths. Emetics and baths are always necessary to internal and an external opening, a probe-pointed bistoury may be introduced through the fistula and brought against the point of the finger as it lies in the rectum; by then drawing down the finger and knife together, the intervening integuments will be severed at one sweep. If the bowel is not perforated by the fistula, a curved, sharp-pointed bistoury should be used and an incision made through the wall of the intestine so that the knife may reach the finger, and then the sphincter severed as before. When the fistula is blind, there being no external opening, the curved bistoury must be introduced through the integuments at that point which is most likely to reach the fistula diriectly, and the sphincter then severed as before.

FIG. 90.



Operation for Fistula in Ano.

The great sensitiveness of the parts in which the fistula is seated, together with the morbid irritation that has been provoked by the long continuance of the canal, renders any operative procedure extremely painful to the patient. Indeed, the most carefully conducted examinations by the surgeon provoke violent suffering; and it is advisable, therefore, to handle the parts as little as possible and to decide upon operative interference only after it has become demonstrable that no system of medication whatever will remove the walls of the fistula and secure the obliteration of the unnatural opening. After the operation has been decided upon, it should not be performed till the patient is put under the influence of chloroform, except he himself insists upon a different course. After the septum has been severed, the patient should be kept in bed and upon the back as much as possible; a piece of oiled silk may be placed between the lips of the wound; lobelia pills, or drinks of any of the nervines, may be given to quiet agitation, and the bowels should not be moved till about thirty-six hours after the operation. It is the surgeon's object to secure granulation of the wound from the bottom, to aid which it is generally necessary to keep up the system of ablutions, tonics and relaxing pills that were employed before the operation was undertaken. It is seldom that judicious management fails in securing the entire obliteration of the false canal, when the patient will regain his health and strength rapidly.

Hemorrhoids—Piles.

The term hemorrhoids is applied to small tumors situated near the anus and which are formed by a varicose condition of the hemorrhoidal veins. They may occur externally, or upon the margin of the anus; in which position they form hard, round tumors and appear to be covered partly with mucous membrane and partly with skin. These are called *open* piles. The tumors may also be situated within the anal ring, when they are softer and strongly disposed to bleed and are called *blind* piles. These tumors seldom occur before the age of puberty; are most common in the higher ranks of life and are found ofteuest in females. They are generally provoked by habitual constipation, though sedentary habits, pregnancy, abdominal tumors, high living, or any other circumstance or influence that impedes the return of the blood from the hemorrhoidal veins, may become developing causes of these peculiar varices. Sometimes they enlarge suddenly, four, five or more of them appearing within a few days and giving rise to very great distress in the parts; more commonly, however, they are developed slowly, there usually being one large tumor with two or more small ones situated near it. The external piles usually present a hypertrophied condition and are very sensitive. The internal piles, on the other hand, are more vascular, the walls of the blood vessels not becoming particularly thickened. These are also more tender and may be provoked to irritation by an endless number of slight accidents, as the continuance of a tendency to constipation, the use of stimulating food, etc. When a number of piles exist together, the sense of fullness and heat in the rectum provokes a tendency to stool, the mucous secretion is discharged profusely and the straining may almost resemble a dysentery.

TREATMENT.—The first care of the surgeon should be to correct the habits of the patient and remove the excitement in the rectum. Patients that live high must be brought down to a plainer diet; the sedentary must be ordered to take outdoor exercise in moderate quantity; the skin should be attended to, a course of tepid sponge baths being directed; the softer vegetable foods should be made to constitute the greater portion of the diet and costiveness must not be permitted to occur. Enemas of lobelia and ulmus are to be given regularly every morning, with the design of unloading the bowels at a fixed hour. If the tumors become irritable and painful, small clysters of the same may be administered every second and third hour through the day and night, the design being to retain the enema. This course of treatment is to be pursued till relief is obtained. A great variety of applications have been advised for these tumors, both with the idea of relieving their irritation (by diminishing their tendency to bleed) and reducing their size. As a general thing, the mild astringents are best, being prepared and applied in the form of ointment. We are very partial to tannic acid mixed with lard. The body of the ointment, however, may be formed of spermaceti, white wax and oil of almonds, incorporated in such quantities as will make a soft mass; and the medicament may be added to this, tannic acid being employed for the purpose, or geranium hamamelis, rubus strigosus or gum kino, being used. When the tumors are near the anus, the ointment may be applied to them by the finger of the patient; if they are beyond the reach of the finger, a strip of linen may be moistened with the unguent, wrapped spirally about a lead pencil and then introduced into the bowel, where the linen may be allowed to remain for such length of time as may seem convenient. In addition to this, the bowels may be lubricated by the use of slippery elm in infusion, and we have used a decoction of rumex and convalaria to good advantage. Some practitioners are very partial to enemas of cold water. The main dependence, however, consists in regulating the system and relieving the tension of the circulatory apparatus by good hygienic regulations and pills of lobelia, the tumors themselves being soothed by relaxants and demulcents, or contracted by astringent unguents or clysters, according to their condition at various times. Very frequently these enlargements may be removed by a persevering course of management of this kind; yet the treatment is more palliative than otherwise, as the tumors are always liable to recur upon a sufficient, or even upon a slight, provocation.

When the tumors become large and prove decidedly inconvenient, no relief being obtained by the medical treatment above mentioned, their removal may be demanded. This is frequently rendered necessary from the fact that the bowel and its tumors protrude through the anus at each stool, causing intense suffering to the patient and soon prostrating the system. Patients afflicted in this way lose blood by the rupture of small arteries almost every time the tumors are protruded; and the derangement of the stomach and bowels is such that a dyspeptic condition necessarily follows. Two modes of removal are adopted, according to the position of

the tumors. When the tumor is external and seems
and not disposed to bleed, it may be excised by two ellip
incisions. The same mode of procedure has been recomm
ed for internal or bleeding piles. The propriety of this
ation, however, may be safely questioned in all cases;
there is at all times a strong liability to hemorrhage, w
it is scarcely possible to check. On this account, the lig
is usually preferred. The system of the patient having
prepared by a suitable course of hygiene and medication,
tumors are to be protruded by efforts at stool, when a liga
is to be thrown over the neck of the larger ones and
tied very tightly. The tension of the thread should be s
cient to strangulate the circulation in the enlargement w
out severing the tissues; but in cases where the tumor is la
the ligature may need to be tightened two or three succes
times, at intervals of three or four days, before the w
protrusion will slough away. This mode of applying
ligature is suitable when the tumors are at all peduncula
but when they are flat and broad, having no constrictio
the base, they can be removed only by stitching ligat
through them in the manner already directed in the case
other erectile tumors (p. 485). After the ligatures have b
applied, their ends may be cut off closely to the knots
the tumors then returned into the bowel. The patient sho
keep the bed quietly, restlessness may be soothed by the
of nervine drinks or a few pills of lobelia, and severe pain
the anus may be relieved by suitable poultices around
parts. The tumor is usually formed into a slough and
off in from five to eight days after its strangulation. Th
is a liability to slight constriction of the rectum as the den
ed surface cicatrizes. This may be prevented by keeping
parts well lubricated with elm mucilage or olive oil.

Hemorrhage from the Rectum.

Bleeding from the rectum is usually associated with pil
but cases occur, especially in females, in which hemorrhage
quite independent of any such enlargements. The veins m
be bursted by the passage of very hard feces, the channel
the bowel being narrowed by the presence of the fetus
utero; at other times bleeding from this part may be vicaric
with obstructed menstruation. In the first class of cas
injections of cold water are usually sufficient to arrest the d
charge, or astringent applications may be made to the ble
ing vessels. In the latter cases, the system must be invig

ated by emetics, baths and tonics and the menstrual function properly restored, when the bleeding from the rectum will usually cease spontaneously.

Prolapsus Ani.

The mucous membrane of the rectum sometimes becomes greatly enlarged and thickened and the sub-mucous cellular tissue much elongated. Under such circumstances, the bowel is protruded through the anus at each stool. This difficulty usually occurs in children and seems to be aided very materially by an irritable condition of the stomach and feebleness of the system. Adults, however, especially those of feeble frames, are not free from this form of prolapsus. It seldom amounts to more than an inconvenience; but the sphincter of the bowel sometimes becomes so relaxed that the intestine can scarcely be retained in its position at all and the repeated protrusion, with consequent constriction of the bowel, may lead to the formation of inconvenient hemorrhoids. Or the mucous and cellular tissues themselves may become so much enlarged, by the continuous irritation, as to prove extremely annoying. In children, the bowel is to be returned by the parent, which may be done by greasing it with any soft oil and then gradually pushing it back with a towel or napkin. Adult patients generally perform the operation for themselves. Permanent relief may be effected by removing some of the redundant folds of the mucous membrane by the knife or scissors. This is an extremely painful, though by no means an important, operation. The plan consists in pinching up a portion of the puckered intestine and then making two longitudinal elliptical incisions. The edges of the wound may then be left to unite, or granulation of their edges may be favored by a single suture. At times, however, there is danger of hemorrhage from the same cause as in ordinary cases of piles, when the redundant tissue may be removed by ligature. It is not well to apply the ligature by transfixing the integument, experience having proven that the attempt is most successful when the folds of the intestine are pinched up and drawn outward and the ligature then applied upon them with sufficient tightness to strangulate the circulation. The rest of the treatment is to be continued on the same plan as that already advised for hemorrhoids.

Very old persons are not unfrequently troubled with prolapsus, which may be considered merely as a mark of advancing senility. The surgeon is seldom justified in offering operative interference in such cases. Stone in the bladder may produce prolapsus at any age.

The Formation of Artificial Anus.

We have already spoken of a few instances, especially cases of hernia and permanent stricture of the rectum, in which it becomes necessary to form an artificial anus. The sigmoid flexure of the colon is the part in the intestinal canal where this operation must always be performed. Two modes of procedure have been advised. That of M. Littre consists in reaching the bowel by a direct incision through the abdominal parietes and peritoneum, the point selected for the operation being that over the left groin. The bowel is reached easily in this way, and can be punctured and its edges brought in contact with the wound in the walls of the abdomen, without much difficulty. It has the advantage of being at a point at which a sort of rude sphincter will be ultimately formed and the feces can be retained, till such time as the evacuation is convenient, by wearing a truss over the aperture. Amussat, however, preferred to reach the bowel from behind, at a point where it was not covered by the peritoneum. The patient having been laid on his face and the abdomen raised up by putting a pillow under it, the external incision is made between the crest of the ilium and the false rib. This incision may be about four inches long through the integument; after which the dissection is to be carried on through the fascia and upon the outer edge of the sacro-lumbalis and the longissimus dorsi muscles, and the bowel thus exposed. The colon may be known by the largeness of its muscular fibers, and by the absence of that ascending and descending motion which is communicated to the smaller intestines by the action of the diaphragm. The large bowel having been thus brought to view, it is to be transfixed by a needle and ligature and then opened. All solid accumulations in the intestine are to be removed by the scoop or forceps, if necessary; the edges of the incised bowel are to be then brought in contact with the edges of the wound in the abdominal parietes and there secured by one or more ligatures. In either mode of operation, a few days are generally sufficient to heal the edges of the wounds, when the artificial anus is complete.

CHAPTER XX.

AFFECTIONS OF THE URINARY APPARATUS.

Affections of the Bladder.

Cystitis.—Inflammatory action may be provoked in the bladder by the contraction of cold, the presence of calculi, sympathetic irritation from the application of Spanish flies upon the surface, by the contraction of gonorrhea or by carcinomatous degeneracy. It has been already seen, in the chapter upon *Inflammation*, Part I, of this volume, that arterial excitement is not in itself disease; but it is always an evidence of the existence of an unnatural condition of the parts in which it is provoked, and suppuration will inevitably take place unless that condition is removed. So in cystitis, the surgeon does not fear the inflammation, but dreads the circumstances or influences that have provoked the arterial resistance in those parts. When, therefore, the patient complains of pain and sense of weight in the iliac region, with constitutional irritation and an inability to pass water freely, it becomes imperative to pay the earliest attention to the conditions to which these symptoms point. Like all other cases of inflammation, the tissues must be relaxed, the engorgement of blood invited from the parts and the irritation soothed by the use of demulcents. A strong infusion of lobelia may be given in small doses, frequently repeated, and so managed as not to produce actual vomiting unless much foulness in the stomach exists. Spearmint, slippery elm, mallows and similar demulcents and relaxants, may then be given to drink in large quantities. The patient is to be confined to his bed, the knees should be slightly flexed in order to relieve the tension of the abdominal parietes and large poultices of slippery elm and lobelia may be placed over the iliac region. Tepid sitz baths are invaluable adjuncts in the treatment. Vapor baths to the lower half of the body may also be given, and enemas composed of slippery elm and lobelia in powder may be administered. It is not advisable to inject mucilages into the bladder itself, although this course has been frequently recommended by authors.

Much perseverance is necessary in the treatment of these cases, which sometimes become chronic and manifest decided symptoms of a tendency to both local and general congestion. Under such circumstances, it is sometimes admissible to use the terebinthinæ, especially the balsam of copaiva, in the form of pills. Such articles, however, are most applicable in cases of cystitis following gonorrhea; and the stimulants should be at all times combined with demulcents in the form of either elm infusion or the oil of sweet almonds.

Irritable Bladder.—The bladder frequently becomes irritable in consequence of unusual acridity of the urine; or any of the causes that provoke acute cystitis may excite morbid sensibility of the nerves. Such cases are simple cases of chronic cystitis, and are to be treated accordingly. Infusion of spearmint, seeds of arctium lappa and althea, are peculiarly applicable.

Paralysis of the Bladder.—The bladder may become paralyzed either in its fundus or at its neck, coming on slowly as the result of local disease or a general paralysis; or it may appear suddenly as a consequence of injury to the spine or of shock of injury. When the neck of the organ is paralyzed, the patient has no power of retaining his urine; but it dribbles away constantly, forming a true case of enuresis. When the body of the organ is the part affected, the neck continuing its contractility, there is an organic inability to expel the urine, which is retained and accumulates to the great inconvenience of the system. These latter cases are the most common, as well as the most difficult to manage. That paralysis, and not stricture, is the cause of the retention of the urine, may be readily known by introducing the catheter—firm opposition being presented to the advance of the instrument in the latter cases, while in the former cases it passes into the bladder with ease. The bladder should be regularly emptied by the catheter in either case; for, in enuresis proceeding from paralysis of the neck of the cyst, the excretion is likely to accumulate in large quantities. When the inability to void the urine is occasioned by compression or injury to the spinal column, nothing can be done for the bladder except as the latter difficulty is removed; but when the cystic paralysis is either local or symptomatic of general paralysis, the patient may be put upon a course of stimulating treatment, using guaiacum, copaiva, buchu and similar renal stimulants in connection with smilax, stillingia and other stimulating alterants. The vapor bath will frequently be found valuable to remove impurities from the system. Cayenne may be used in small quantities and the electro-magnetic battery employed daily. In short, the treatment is to be in all respects the same as that which has been directed for paralysis in general (see p. 46).

Incontinence of Urine—Enuresis.—Enuresis is a very common affection of childhood and depends upon an irritable condition of the bladder, with feebleness and excitement of the whole system. The child passes its water voluntarily, but with unusual frequency, during the day time; and at night he passes it involuntarily, to his great shame and the annoyance of the parents. Parents are apt to attribute it to carelessness or indifference on the part of the child, and to scold or punish him accordingly. No course of treatment could be more decidedly injudicious. The management should consist in allowing the child moderate, but not fatiguing, play; the condition of the bowels and stomach should be attended to and any tendency to irritability relieved by the use of relaxing tonics, as eupatorium, columbo or populus; the bowels should be unloaded by enemas; the food should be nourishing, but unstimulating and the bed upon which the child sleeps should be hard and the hours of rest properly regulated. A system of tepid water bathing should be practiced, and friction along the spine will be found of much benefit. The system may sometimes be so irritable as to demand the use of lobelia pills. Worms, when present, should always be removed by appropriate treatment and the child should be thus judiciously cared for and aided to avoid night accidents, rather than scolded for their occurrance. Adults, however, sometimes suffer from incontinence of urine, which is then merely a symptom of some more serious difficulty, as paralysis of the bladder, injury to the spine or organic derangement of the spinal column. The bladder itself is to be relieved by the use of the catheter and the difficulty treated according to its nature.

Retention of Urine.—Retention of urine is a very common, and at all times a very serious, difficulty. The bladder becomes distended with water, there is a strong but unavailing desire to micturate and great pain through the loins and lumbar region; the bladder becomes extremely tender and can usually be felt above the pubes, where it forms an oval tumor extremely sensitive to the touch; the cyst may burst and the urine be extravasated if it is not relieved of the urinal accumulation. In the majority of instances, spasmodic stricture of the urethra is the cause of the retention. Such cases are treated by warm sitz baths and the use of lobelia to the point of decided nausea. The sitz baths may be repeated every hour or two hours, and the lobelia may be continued till decided relaxation of the system is produced. No attempt to introduce the catheter should be made till it has become evident that the parts are ready to yield, when a small sized flexible instrument may be gradually passed up the urethra and the difficulty thus overcome.

Retention may also occur as a sequence of inflammatory swelling in the urethra, as in severe cases of gonorrhea; it may follow upon priapism resulting from injury to the spine or from venereal excesses. In these cases, the sitz baths are to be mainly depended upon, besides which a poultice composed mainly of lobelia seeds may be applied to the perineum, over the penis and above the pubes. Small doses of lobelia may be given internally, if necessary. The presence of abscesses in the pelvic region, the existence of extravasated blood from injury to the perineum, and enlargement of the prostate, may all lead to the retention of urine. Malignant disease of the penis, imperforate urethra and tumors growing in or near the course of the urethral canal, are liable to give rise to the same difficulty; and calculus, whether in the bladder or in the urethra, necessarily interferes with the free flow of the water. Retention under these circumstances demands relief, but its secondary nature is such that the chief attention is to be paid to difficulties outside of the cyst itself or at least not connected with any organic degeneracy of this body.

Pelvic abscesses are to be discharged as early as possible. Extravasated blood in the perineum may be treated in the same way. Calculi and tumors are to be managed after the manner which will be presently pointed out. The surgeon should, however, be extremely wary in introducing the catheter; for it is very easy to do most serious mischief by a rash insertion of the instrument. Cases of retention sometimes become so serious that the bladder will have to be punctured in order to avert the dangers of extravasation. This is a harsh alternative for the surgeon, but one which must be resolved upon with decision and practiced promptly when the nature of the case demands it.

Extravasation of Urine.—Urine may be extravasated either in consequence of a wound, ulceration or laceration of the bladder, or ulceration of the urethra following as a sequence of stricture or gonorrhea. Urethral extravasation is most common, the structures giving way suddenly during a straining effort and the urine consequently escaping among the tissues, where it gives rise to great pain, heat, swelling and redness. These symptoms are shortly followed by the purple hue of congestion and this in turn by the blackness of gangrene. Typhoid symptoms are soon manifest, a urinous odor is exhaled from the whole body, the tongue becomes black and the skin clammy, hiccough and muttering delirium follow and death is inevitable in a short time, unless relief is obtained. The same series of manifestations follow when the extravasation is vesicular. In these cases, the bladder may give way at any point, but most commonly yields near the bulb of the urethra and upon its posterior walls. In cases of retained urine, the perforation of the cyst is generally due to ulceration, though the distention of the bladder may be so great, and its tissues stretched to such a degree, that ordinary motions and the straining efforts of micturation may cause the parietes to give way. Kicks and blows over this viscus, when it is but moderately filled with water, may cause the cyst to give way and allow the urine to be extravasated, as before.

The surgeon's chief object should be to avert the dangers of extravasation by puncturing the bladder before its parietes give way. When the cyst has burst, however, the infiltrated urine must be evacuated by a direct incision through the perineum, the finger having been previously introduced up the rectum in order to guard the knife from severing the intestine. The incision should be free and made deeply in the direction of the urethra. The extravasated water need not be expected to escape in a gush, but it will soon ooze to the aperture and find its way out. If water has lodged in the scrotum and penis and upon the thighs, free incisions should be made in these parts also, as soon as swelling is observed. This mode of procedure is the only hope the patient has for life, as extensive gangrene and constitutional depression can not be avoided in any other way.

After the incisions have been made, the patient must be at once put upon a thorough course of invigorating medication. Stimulating emetics, such tonics as hydrastis and gentiana, infusions of zinziber, aristolochia or composition freely, and a good dietary, are proper. These measures are necessary to brace the system against the depression of the gangrene which is sure to occur, and also to limit the sloughs and repair the losses and abrasions that have taken place. The patient must be kept quiet, the openings kept clean and measures then taken to overcome the stricture.

Tumors of the Bladder.—The renal cyst is not uncommonly troubled with eglargements of both a simple and malignant character. The mucous membrane of the cavity may be studded with numerous polypi, or cancerous enlargments (especially encephaloma) may be developed. In either case, there is more or less irritability of the organ and an unusually frequent desire to micturate. If the tumors are situated near the neck of the urethra, they may partially interfere with the passage of the urine; but more commonly the sides and fundus of this organ are the seats of these growths, which provoke most of the symptoms ordinarily belonging to calculus.

Their presence can be detected by the introduction of the sound, to which they present the feeling of moderately soft yet movable substances. When the growth is malignant, the patient is apt to waste away rapidly and the urine is always fetid and bloody. It is not possible to do more than palliate any of these difficulties—the cancerous enlargements leading to death at a sooner or later period, the simple enlargements always proving troublesome without causing any serious difficulty. The sensitiveness of the bladder may be relieved by the use of arctium lappa seeds, spearmint, pills of lobelia and sitz baths, while the strength may be sustained and the circulation purified and invigorated by tonics, stimulants and alterants, as has been already directed for cancer in general.

Hematuria.—Bloody urine may come from either the kidney, the bladder or the urethra. In the kidney it may be provoked by the presence of small renal calculi, or follow upon violence to the back or ordinary shocks of injury. The urine is always evenly colored with blood in such cases, and fibrinous flocculi frequently float in it. Bleeding from the bladder may be provoked by the presence of calculi, malignant tumors, ulceration following gonorrhea or retention of urine, severe colds or the presence of worms in this viscus. Blood may escape in large quantities and apparently unmixed with urine, while again the urine is streaked with it in small quantities. From the urethra, blood may be discharged in consequence of ulceration, excessive erections during chordee, the passage of small calculi, etc. In all cases, the bleeding is merely symptomatic and is to be relieved by the treatment most appropriate to the several conditions which give rise to it. Calculous difficulties are to be removed by the measures to be hereafter mentioned. The patient should be at all times soothed and irritability of the bladder quieted by the use of demulcents and relaxants and the system is to be invigorated by tonics and alterants, when ulceration is the cause of the hematuria. The bleeding from gonorrhea is to be remedied by the measures already directed for that difficulty.

Puncturing the Bladder.—The bladder may need to be punctured in cases of long continued retention of urine in order to avert the possibility of rupture and extravasation. Three methods have been employed, namely, by the perineum, by the rectum and over the pubes. The operation by the perineum is nearly always preferable. It is performed by laying the patient on his back, flexing his thighs toward the abdomen and bringing his heels against his buttocks, the nates being at the same time brought toward the edge of the bed or table upon which the patient lies. The incision is then made through the perineum as in the operation for lithotomy, the trocar and canula introduced through it and the bladder punctured with the former instrument. Or a catheter may be passed down through the urethra to the point of constriction and a straight-edged bistoury directed through the raphe of the perineum till it reaches the urethra at the point where the impeded urine causes dilatation. After either operation, a flexible catheter is to be introduced through the opening and there retained till the stricture is removed by appropriate measures.

In the operation by the rectum, the finger of the operator is to be introduced into the bowel and a curved trocar and canula passed along it. The prostate gland having been defined, the trocar is to be plunged through the bowel and into the bladder behind that organ. The trocar having then been withdrawn, the canula may be worn, or a catheter introduced till the strictures have been overcome. This operation is the most simple, but is very likely to leave a fistulous opening between the rectum and the bladder, and is for this reason seldom performed. The operation by the pubes is rarely undertaken. It seems admissible only when structural difficulties interfere with the other operations. It is performed by shaving the pubes, making a small aperture through the abdominal parietes immediately above the symphisis and then puncturing the bladder at this point. All these operations are liable to be followed by very unpleasant urinous fistulæ and are only to be undertaken when the case assumes a serious aspect. They are not then to be delayed for a moment. The opening through the wall of the bladder and the other tissues may be treated by keeping the patient quiet and the edges of the wound in apposition and then sustaining the granulating power of the system by good vegetable diet (with the occasional use of lean meats), by hydrastis, populus and other tonics, alterants when the system needs them, and a series of ablutions to aid the depurative action of the skin.

Affections of the Prostate.

Abscess.—Cold, injuries in the perineum and frequent lodgment of hard feces in the rectum and bowels, may provoke inflammatory action and lead to congestion and terminate in abscesses of this part. The patient complains of heat and pain in the anus, tenderness of the perineum, with a difficulty of making water; the bowels are evacuated with pain; the abscess feels large, hot and tender when examined per rectum and there is a sense of weight in the perineum. Rigors denote the accession of suppuration, and fluctuation may be felt after the pus has accumulated. The discharge may be into the urethra, when it is known by the voidance of pus with the urine. Urinous abscesses are very likely to follow discharge in this direction. Or the pus may find its way to the rectum and establish a recto-vesical fistula; or it may reach the surface of the perineum. Before the formation of pus, the patient must be put upon an active course of tepid sitz baths, lobelia and ulmus poultices around the perineum, with infusions of lobelia, lobelia and asclepias, or eupatorium, an occasional vapor bath and confinement to a recumbent position. The moment fluctuation can be detected, even though obscurely, the pus must be evacuated by an incision through the perineum. The patient is then to be treated in the manner already directed for other abscesses. If the pus discharges spontaneously into the urethra, it is proper to empty the bladder by the occasional use of the catheter, as this course usually prevents the formation of ulcers through the canal.

Enlargement.—The prostate gland occasionally suffers simple enlargement, or hypertrophy, the whole organ becoming increased in size or only one or the other of its lobes being thus affected. The difficulty is almost wholly confined to persons advanced beyond the age of fifty and is peculiarly an affection of adult life. It may, however, be provoked by the existence of stricture, by gleet, injury of the perineum, habitual costiveness and similar irritating influences. The enlargement generally proceeds slowly, usually causes elongation and tortuousness of the urethra and invariably interferes with the free passage of water. There is not an actual stricture of the urethra, but the urine is voided slowly and with a sense of uneasiness; the urine itself is not uncommonly pale and smells rather acrid and is mixed with mucus; ultimately it may become dark and still more largely mixed with mucus, and even pus may be discharged in long standing cases in consequence of chronic ulceration of the mucous surfaces of the bladder. The bladder itself becomes more or less irritable, incontinence of urine is occasionally observed, the whole renal apparatus may become deranged and death may be caused by gradual exhaustion. The enlarged prostate can be distinctly felt by examination per rectum.

The treatment of these cases is very difficult and the practitioner can do little more than check the progress of the enlargement and maintain a good condition of the constitution. By the use of vapor baths, the system may be depurated of offensive materials; and alterants and tonics will still further purify the fluids and support the nutritive apparatus. By these means the absorbents may be made more active and the tendency to structural decomposition of the prostate averted. The parts themselves, however, should be at all times quieted by the use of relaxing enemas both to unload the bowels and relax the tissues of the prostate by their contiguity. Such relaxing diuretics as the seeds of arctium lappa, mentha and acer striatum, may be given freely when the bladder is irritable; buchu and uva ursi have also been recommended, though their applicability is rather doubtful. The urine should be regularly withdrawn by the catheter, which must be introduced with the greatest possible care. When the middle lobe of the prostate is enlarged, it may rise up within the cyst and form a prominence directly at the neck of the bladder, against which the point of the catheter commonly strikes as the surgeon is introducing it. This fact must be borne in mind and the handle of the catheter depressed under such circumstances. Sometimes the neck of the bladder enlarges and forms a kind of *cul de sac*, which may attain a size almost equal to that of the bladder itself. As the catheter reaches this point, a few table-spoonfuls of urine may escape; but the surgeon must be on his guard and not allow this fact to deceive him into the belief that he has reached the true bladder. As stricture advances, the case must be watched with increasing care, for the difficulty then assumes a serious aspect. The treatment appropriate for stricture will be mentioned presently. When the urine is retained in consequence of the occlusion of the urethra, and relief is not afforded by the catheter, the bladder must be punctured without delay. It is usually necessary, in puncturing these cases, to make incisions through the perineum and reach the bladder by the prostate. The trocar may be then withdrawn and the canula retained for several days. The urine is generally withdrawn gradually and not allowed to escape all at once.

Affections of the Urethra.

Urethritis.—The urethral mucous membrane may be provoked to inflammatory action, and the circulation brought into a state of congestion, by an almost endless variety of influences—gonorrhea, leucorrhea in the female, excessive exercise on horseback, too tight clothing about the penis, and similar circumstances, being the most common provocatives. The membrane swells and partially occludes the passage, water is voided in a small stream and always with pain, the parts feel hot and there may be a purulent discharge after suppuration has commenced upon the urethral surfaces. The treatment is to be in all respects similar to that for gonorrhea, as has been already directed in Part II of this volume.

Stricture.—Stricture of the urethra, as has been already mentioned in speaking of retention of urine, may be either spasmodic or caused by fibrinous growths in the course of the canal; or it may consist in swelling of the urethra in consequence of an engorgement of blood. The effect in each case is the same, namely, retention of the water with consequent pain in the bladder, general febrile excitement and danger of extravasation by rupture of the cyst. The treatment demanded in the different cases, however, is by no means the same, hence each class may be considered separately:

1st. SPASMODIC STRICTURE.—This consists simply in a temporary spasm of the muscles entering into the structure of the urethral membranes. It is usually provoked by exposure to cold, and may be connected with gonorrhea or excited by undue riding on horseback. It comes on rather suddenly, in which respect it is readily distinguished from the third class of stricture. It is relievable by lobelia and sitz baths, as has been already mentioned in retention of urine.

2d. CONGESTIVE STRICTURE.—In this variety of these cases, the mucous membrane of the urethra becomes puffed out by the engorgement of blood and the channel is necessarily occluded to a greater or less degree. The passage of the water is seldom wholly prevented, but the parts may be extremely painful, micturation is always difficult and ulceration of the urethra may be provoked by the passage of acrid urine. It is usually sequent upon gonorrhea, but may be provoked by injuries to the penis, long continued exercise on horseback, injuries to the perineum or even by acrid urine. It is to be managed by using pills of lobelia, infusions of ulmus, seeds of arctium lappa, or spearmint and althea, by tepid sitz baths and general quiet. It is always temporary, generally giving way in two or three days.

3d. PERMANENT STRICTURE.—This variety of stricture is the result of plastic exudations in the urethra, following upon injuries over or near these parts or upon the excitement of long continued gleets. The latter difficulty is probably the most frequent cause of this class of accidents. The plastic deposit may take place at any point from the bulb of the urethra to its orifice, though it is most common to meet with it opposite the suspensory ligament or in front of the membranous portion of the urethra. The deposit may form into firm bands, which gradually occlude the whole diameter of the canal; but sometimes the canal is rendered tortuous and the plastic growths only partially occlude it at different points through its course. In these last cases, it is seldom that the occlusion becomes so great as to deny the passage of a little water. In a few instances, the whole urethra has become entirely impermeable.

It might be supposed that, so long as some water was allowed to pass, but little difficulty would be experienced frôm a stricture. Such is not the case; for violent constitutional irritation is provoked, the patient is racked by an agonizing desire to micturate, the digestive apparatus becomes deranged and the skin emits a foul odor, typhoid symptoms are not uncommonly manifested and the pains in the urinary organs themselves are always harassing, particularly at night, at which time there is the greatest straining, the urine passing away more or less crooked in its stream and with an extremely burning sensation. There may be a slight purulent discharge and the patient may even suffer a chordee when it is evident that no gonorrheal contamination exists. The part of the urethra anterior to the stricture becomes collapsed and contracted, while directly posterior to the obtruction the canal becomes greatly dilated and is strongly inclined to ulceration. Calcareous material is not unfrequently deposited at this point and inflammatory excitement in the prostate gland is to be expected. These symptoms do not all appear at once, but advance gradually upon the patient, weeks and months passing away before complete stricture takes place.

TREATMENT.—The treatment of organic stricture requires the greatest care and caution on the part of the surgeon; yet the seriousness of these cases and their liability to a fatal termination demand that prompt remedial measures be employed. Three modes of procedure have been adopted: *first*, mechanical dilatation; *second*, division of the contraction; and, *third*, the application of caustics. In the process by mechanical dilatation (which is only applicable where the stricture has not become complete), the system of the patient is first to be prepared by the use of nervines and infusions of arctium or spearmint to relieve the acridity of the urine. The patient is then laid upon his back, with a pillow under the pelvis and the knees moderately elevated. The passage may then be explored with a wax bougie till the position of the stricture is clearly defined. A small curved metallic bougie, or catheter, is then introduced. The instrument must be passed along the canal with great caution, the convexity looking toward the urethral side of the penis, till the suspensory ligament is reached; it is then to be turned nearly half way round and pushed onward gently. The stricture, however, may be met with before the catheter reaches the suspensory ligament, and this may be known by the resistance offered under the force applied by the surgeon's hand. Wherever the occlusion exists, whether in the anterior or posterior portion of the urethra, the utmost caution must be exercised the moment it is reached. The catheter should be held lightly in the hand and advanced steadily and without violence. If it is possible to permeate the canal at all, the walls can not be expected to yield otherwise than slowly; and the least rashness, or an undue exercise of force, may perforate the membranes and lead to false passages. If the point of the instrument meets with resistance, the surgeon should draw it back a little and then again advance it cautiously and steadily as before. If the obstacle gives way suddenly before pressure, the surgeon may be assured that he has ruptured the membranes; and, however desirable it may be to overcome the stricture, it is far preferable to leave it unremoved and empty the bladder by perforation, than to run the risk of causing this accident.

If the surgeon is successful in thus introducing the catheter to the bladder, the instrument may be allowed to remain there from a minute to a half hour, according to the degree of excitement it provokes. Very sensitive patients scarcely admit of its retention more than a minute, and the rule should be always to remove it as soon as the patient complains of its presence. Removal should be practiced as cautiously as introduction and the patient should be left quietly for twenty-four, forty-eight or more hours, according to the condition of the parts. Pills of lobelia may be given in the mean time and the vapor bath may be applied as the patient lies upon the bed. These favor depuration and the absorption of the plastic deposits, and spearmint and similar relaxing diuretics may be also used. After the excitement in the urethra has passed away, the instrument may be again introduced, then withdrawn and one of the next largest size be made to follow. By pursuing this course of management for a few weeks, enlarging the size of the catheter from time to time as the patient can bear it, the canal may be ultimately dilated to its natural size. Gentle arterial action is thus provoked, which, together with the increased depurative action of the skin, may gradually remove the deposits and terminate in a cure. The surgeon must be on his guard, however, for syncope, rigors and similar unpleasant feelings caused by the passage of the instrument as it reaches the neck of the bladder. Generally speaking, these feelings are but temporary; but at other times they become very marked and persistent, when they are to be relieved by drinks of asclepias and lobelia, zinziber and asarum in weak infusion, or eupatorium.

2d. DIVISION OF THE STRICTURE.—Division of the stricture is performed in two ways: *first*, By introducing a steel instrument containing a lancet-like knife enveloped in it and then incising the obstructed parts by pushing the blade of the knife forward. This procedure is only applicable to occlusion of the first part of the canal, and is even then fraught with very great danger. Its employment is admissible, however, when it is evident that the contractions are very hard. The instrument is generally straight, though some surgeons prefer to employ a slightly curved one. Dr. Pancoast preferred to use a curved instrument somewhat like a canula, with a groove upon its back. A piece of fine catgut is first carried into the bladder and the curved stylet passed into the urethra along the course of the string. When the stricture is reached, the blade of the instrument is pushed out, the string serving as a director to it. Or if the catgut cannot be carried into the bladder at the commencement, it is to be passed along the urethra as far down into the stricture as possible and then the blade of the instrument used as before. Dr. Pancoast's success has been very excellent, though it must be confessed that the procedure looks very hazardous.

The *second* mode of procedure consists in incising the perineum, as for lithotomy. The patient is to be placed upon his back, a grooved staff introduced into the urethra and an incision then made in the raphe of the perineum, in the direction of the urethra. The dissection should be proceeded with very carefully and the wound need not be large. The groove of the staff having been reached, the point of the knife is to be carried along through the stricture and the staff then removed. A moderate sized catheter is then introduced and left in the bladder for twenty-four or forty-eight or more hours. The hope of the surgeon now is, to have the incised parts heal firmly around the catheter. In order to favor this end, the patient must be kept quietly upon his back, the catheter removed often enough to relieve the patient and an instrument of a larger size introduced each time, and the strength of the system preserved by that course of medication which the necessities of different cases may demand. Where the system has been invigorated before this operation, the success is very encouraging and adhesion may take place without the least untoward accident. Sometimes the cure may be delayed, but the stricture is generally removed successfully and the patient ultimately stands in no danger of its recurrence. It is proper to remember, however, that this operation ca be performed in any case where the curved staff cannot introduced beyond the stricture; for without the guide of staff, the surgeon has no means of knowing when or w or how far to pass his knife. Old and very hard cases those that are most amenable to this mode of procedure, it should never be undertaken till the patient has been t oughly relaxed with lobelia or placed under full anesthesi

3d. OPERATION WITH CAUSTIC.—This consists in introduc a bougie inclosing a probang armed with caustic, the esc rotic being pushed against the edge of the stricture from t to time, according as the patient can bear it. Generally, i well to carry on the operation directly till the whole strict has been overcome, the instrument being insinuated fr point to point and removed for a few moments at a time give the patient relief. After the stricture has been t broken down, the catheter is to be introduced and worn, be removed from day to day and its place supplied by a lar sized one in order to prevent contraction of the parts dur cicatrization.

Urinous Abscess.—Small abscesses are liable to arise al the course of the urethra, being excited on the external s face of this passage by injury, by irritation of the pass itself or by operative procedure upon it. More common however, it begins on the inner surface of the urethra, t mucous membrane becoming ulcerated, the urine finding way into the surrounding tissues and there provoking sup rative destruction and leading to deep excavations. The vance of these abscesses is sometimes considerable. They usually situated in the perineum and disposed to rapid sloug ing of this part. The cellular tissue of the scrotum is so times similarly affected, and the spermatic cord and tes may be entirely bared by the suppuration. The abscesses a seldom dangerous, though they frequently lead to fistulo openings which are very troublesome. In treatment, th should be discharged by an incision as soon as fluctuation detected, though the perineum may be opened before a fluctuation is manifest. The strength of the patient is afte ward to be sustained by tonics, alteratives and stimulants, such forms and manner as would be advisable for the aft treatment of any other case of abscess.

Laceration of the Urethra.—Allusion has been frequent made to the liability to urethral laceration in cases of stric ure, the rupture of the integuments being caused by the forc efforts of micturation or by the ulceration consequent upo retained urine. The accident is a troublesome one in cons quence of the strong disposition it gives to the formation of urinous abscesses. It is managed by relieving the stricture and then passing the catheter into the bladder and allowing plastic depositions to take place around this instrument. A few days generally suffice to remedy the abrasion in the channel.

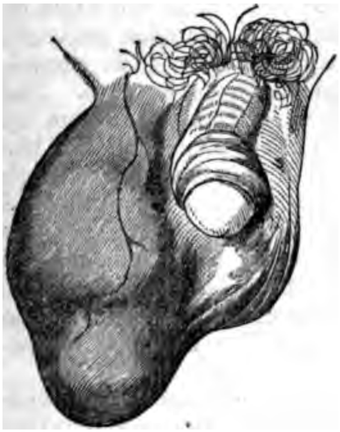
CHAPTER XXI.

AFFECTIONS OF THE MALE GENITALS.

Affections of the Testicle.

Orchitis.—The testicle may have inflammatory excitement provoked in it either by injury or by the sympathetic irritation of gonorrhea; and, in a few instances, it is known to be sympathetic with mumps. The whole organ may become enlarged or the epididymis alone may be affected. The gland swells, feels painful and weighty and there is a dragging sensation upon the cord; the scrotum reddens, the groin and loins feel unpleasant and there is usually a very sharp pain in the back. When the symptoms are acute, the pain becomes very excruciating; but is less severe in subacute cases, when the scrotum upon the affected side shows its blood vessels plainly and presents an oval appearance in consequence of the enlargement of the testicle within it. The scrotum is also painful to the touch, tense and glistening red; there may be general febrile disturbance with a tendency to nausea, and even actual vomiting, when the difficulty is not relieved. The influences that provoked the inflammation being allowed to continue, suppuration may take place and serious abscesses be formed. Such cases, however, are rare.

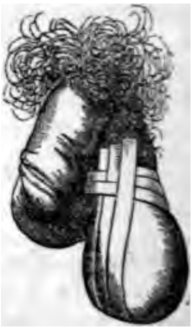
FIG. 91.



Appearance of the Scrotum in Acute Orchitis.

In treating this difficulty, the first necessity is to relax the tissues and depurate the system of morbific matter, and then invigorate the circulation so as to throw off gonorrheal virus whenever the orchitis results from this contamination. The patient should be directed to lie still upon his bed, the scrotum should be suspended in a sling in order to take away the sense of dragging on the cord, and pills of lobelia and drinks of asclepias and lobelia, or eupatorium, are to be given to the point of gentle diaphoresis. The whole scrotum may be enveloped in a poultice of elm and lobelia, and a general vapor bath will give decided relief. When the urine is acrid or scalding, mentha or seeds of arctium lappa, should be administered freely and drinks of ulmus may be also advised. This treatment is generally successful in a few days. When the testicle suppurates, the presence of pus is usually denoted by ordinary fluctuation, when the purulent material should be let out by an early incision. The testicle generally presents a fungating surface after the cavity of the abscess has been opened, and it is not uncommon to have extensive suppuration threatening. The edges of the abscess may unite with the edges of the punctured scrotum and the fungous granules protrude quite through the orifice and overlap the edges of the wound. The utmost quiet must be maintained in such cases. The edges of the scrotum are to be separated from the fungus by dissection and the enlarged granules then pushed within the sac and kept from protruding by one or more sutures through the integuments. The granules usually become consolidated and, if the patient is maintained in good health by suitable medication, there is generally little difficulty in closing the wound and having the parts return to their normal health. The enlargement of the gland, however, is likely to continue and its function may be partially lost. The difficulty is usually confined to one testicle.

Fig. 92.



Sling for Scrotum.

Scrofulous Testicle.—Tubercular depositions not unfrequently take place in the testes, producing a hard and indolent swelling, which presents the feeling of a nodulated tumor and causes a sense of uneasiness and even of pain. Sooner or later the testes gradually inflame, their bulk increases, the epididymis enlarges, one of the nodules is felt to become soft and finally the integument over it gives way and a suppurating surface is presented. The sore resembles a true scrofulous ulcer, suppuration being moderate, the surface indolent and a reddish-yellow granular fungus ultimately springing out from it. In favorable cases, the discharge gradually diminishes, the fungus recedes and the scrotum closes over the testicle and heals up; or a fistulous opening is left, which continues to discharge small quantities of tubercular pus.

Whenever the testicle presents a nodulated feeling and is found to swell slowly and without much pain, scrofulous degeneracy may be suspected. The patient should be put immediately upon a course of alterants, with a vegetable diet, sunlight, moderate exercise and a course of vapor baths, as has been already directed for scrofula in general. By the energetic and persevering employment of these measures, the further enlargement of the tumor may be prevented. If one or more of the nodules become soft and it is evident that suppuration has taken place, the scrotum should be incised and the purulent material evacuated. The former alterative and invigorating treatment must be then pursued and the parts kept cleanly till they heal up. If, however, the ulcer is disposed to degenerate and the tubercular depositions seem to be extensive, their ejection is to be aided, not only by the constitutional treatment, but by the course of poultices and washes which has been already advised as appropriate to all scrofulous ulcers (see p. 174). After the parts have been thus well freed of the strumous material, the scrotum should be lightly strapped in order that it may granulate more readily. If large fungi protrude through the aperture in the scrotum, burnt alum may be sprinkled upon them if they are indolent, or hamamelis or geranium used upon them if they are irritable. Some surgeons advise to shave the fungi off and then press the mass within the scrotum and bandage the parts. Interference with the knife, however, is unjustifiable, and the surgeon will find little difficulty in getting rid of the fungi by astringent applications and then returning the diseased organ to its envelop, favoring the union of the latter by the constitutional invigoration already advised.

Sarcocele.—Sarcocele may be simple or malignant, but is most commonly the latter. Sometimes the growths are encysted, the testis enlarging and becoming hard and being covered with a great number of small cysts, which are filled with an amber colored or brownish fluid. It differs from hydrocele in presenting a yellowish-white rather than a translucid appearance; it is also more globular than hydrocele and is not so likely to be attended with a varicose condition of the spermatic cord. The true nature of the case, however, cannot always be told except by puncture, which may be practiced with safety, as the organ has to be removed in case of its being an encysted sarcocele. The truly malignant tumor of the testicle is generally of the encephaloid character, which usually develops itself with clearness as the difficulty advances. The patient first complains of a dragging weight in the testis and the organ is usually found hard and enlarged without any particular alteration of the scrotum; after a time it increases rapidly, becomes round, feels doughy and the scrotum then becomes reddened and greatly distended and the network of veins presents the tortuous appearance common to encephaloid tumors elsewhere. As the difficulty increases, the part becomes tender and lancinating pains extend through the cord into the loins. Removal of the testis is the only course left to the surgeon, and even this is more palliative than otherwise, as the difficulty is liable to return almost immediately and secondary cancerous depositions commonly take place through the system.

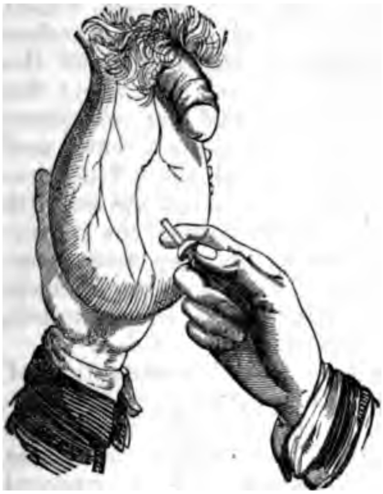
Neuralgia.—Nervous persons, and those who have indulged in venereal excesses, are liable to neuralgia of the testes, which may be also provoked by dyspeptic difficulties or even by piles. The pain occurs in paroxysms and is usually very intense, the period of remission being occupied by constant uneasiness and tenderness in the part. There is no swelling or engorgement of the organ, but the body of the testis is extremely tender upon pressure and the pain extends upward into the loins. The treatment consists in relaxation; the prima via must be unloaded regularly, the condition of the stomach carefully attended to, enemas of elm and lobelia given frequently and retained, and the scrotum enveloped in a poultice of lobelia if necessary. Castration has been sometimes recommended in chronic cases, but the judicious surgeon will never perform it.

Atrophy.—Old age, as also chronic forms of disease, may lead to atrophy of the testicle, the gland gradually diminishing in size and occasionally suppurating. The organ can never be returned to its natural dimensions, but invigoration of the system may prevent further degeneracy and avert the contingency of suppuration.

Hydrocele.—Hydrocele implies an accumulation of serous fluid either within the tunica vaginalis, the spermatic cord or the emptied sac of a reduced hernia. That variety in which the tunica vaginalis becomes distended with fluid, is most common. The difficulty is first noticed by gradual swelling at the bottom of the scrotum, no inflammatory excitement being present and the patient, to all appearances, being in ordinary health. This tumor gradually enlarges in size, causes a slight feeling of weight in the parts, provokes no pain and ultimately forms a pear-shaped enlargement, extending upward quite to the groin. It is distinctly fluctuating under the fingers and contains a yellowish-white fluid, which appears translucent when a candle is held behind the scrotum. This fluid, however, sometimes becomes dark colored, and the thickening of the scrotal walls may prevent the transmission of light through the enlargement. The nature of the difficulty can be distinguished from hernia by the signs that have been already mentioned at page 582. Persons advanced in life are most liable to be troubled with hydrocele, but children are not unfrequently affected by it. The difficulty is not a serious one, though very annoying to the patient.

The bulk of the scrotum can be relieved by tapping it and allowing the fluid to escape. In performing this operation, the surgeon grasps the back of the scrotum with his hand and tightens the skin over the front part of the enlargement (which generally occupies but one side of the scrotal sac). A small lancet, or a suitable trocar and canula, are then introduced through the integuments to the fluid. The point of incision is usually about half way from the base of the penis to the extremity of the enlargement, and the instrument should be at all times directed upward and backward and not horizontally. The testis lies in the lower and back portion of the cyst and might be severely wounded by introducing an instrument in the latter position. All the fluid may be allowed to escape immediately, after which the patient should have a good vapor bath and then be put quietly to bed. This will so far relieve the soreness of the parts that not the slightest inconvenience will be felt from the operation.

FIG. 93.



Tapping for Hydrocele with a Trocar and Canula.

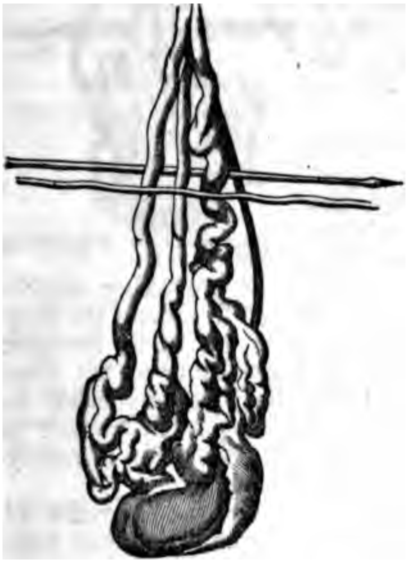
These scrotal dropsies may be relieved, in this way, as often as the serous fluid accumulates; but this is only palliative treatment, the radical cure of the difficulty being a rather unpromising task. The effusion of the serum seems to depend entirely on capillary stagnation and is seldom accompanied with a full and vigorous pulse. The skin, also, is liable to be cold in persons thus affected, and the bowels are generally costive. Secure action at the skin by the frequent use of vapor baths, unload the lower bowels by enemas of lobelia and ginger in ulmus, relieve the upper bowels by leptandra or juglans, sustain the digestive and assimilative apparatus by populus, hydrastis or gentian, and keep the scrotum snugly bandaged and the patient warmly clad. These are the means chiefly to be relied upon in attempting to overcome this difficulty, which may be ultimately accomplished by perseverance.

When hydrocele is situated in the *cord*, it is usually encysted, the membranes of the cord becoming adherent above and below and thus enveloping the serous effusion. The swelling is seldom large, gives no uneasiness and usually appears of an oval form near the inguinal canal, on which account it may be mistaken for inguinal hernia. It is smooth and elastic, but gives no impulse upon coughing, as all herniæ do. Young persons are most subject to this form of hydrocele, which may be relieved by incision in the ordinary way. Another variety of hydrocele has been mentioned, which occupies the epididymis and consists of a number of small sacs, about the size of peas, which contain a clear fluid and are sometimes occupied by spermatozoa. These sacs frequently burst and discharge their contents into the tunica vaginalis. They present a nodulated enlargement upon the surface of the scrotum and may be relieved by incisions. Modern surgeons recommend to treat all cases of hydrocele by injecting some preparation of iodine into the empty sac. Such a course of management is entirely improper and should never be attempted, however fashionable it may have become.

Hematocele.—This term is applied to an accumulation of extravasated blood, either in the tunica vaginalis, in the scrotum or along the course of the spermatic cord. It is most common to have the accumulation occur within the tunica vaginalis, the scrotum swelling, presenting a dark grumous appearance and fluctuating. The enlargement is usually globular and both cysts of the scrotum are liable to be occupied by the sanguineous accumulation. It is usually caused by blows and other violence to the parts. The blood remains fluid, but gives a heavy and semi-elastic feeling to the enlargement; in a few cases, the fibrinous coagula become consolidated. This difficulty is generally treated by keeping up a full circulation of blood toward the skin and increasing the depurative action of the surface; the bowels are at the same time to be kept regular by suitable means and the general health supported by tonics and relaxing alterants. By this management, the blood usually disappears slowly and the parts return to their normal condition. Sometimes suppuration of the parts is strongly threatened, under which circumstances the scrotum must be freely incised and the fluid let out. Hematocele occasionally supervenes on hydrocele, when tapping may be practiced, as has been already directed for the latter difficulty.

Cirsocele—Varicocele.—This is simply a varix of the spermatic veins and is a very common difficulty during the middle and latter portions of life. The parts swell gradually and present a pear-shaped enlargement, the lower end resting upon the testicle and the upper end generally reaching to the inguinal ring. The veins feel large and tortuous and roll under the fingers like so many cords; the swelling is decidedly inconvenient, though it seldom causes any pain. The recumbent position allows the varicose condition to partially disappear, but the full distension of the veins is apparent as soon as the patient stands up. The peculiar feeling of the cords will at once distinguish it from all other forms of disease. It is most common to the left testicle and is not unfrequently connected with mental despondency. The general health is usually good.

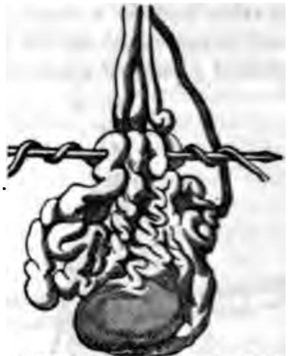
FIG. 94.



Position of the Pin and Wire introduced for the obliteration of Varicocele.

In treating this difficulty, the testicle should be supported by a bandage, the patient kept as quiet as possible, the diet made mostly vegetable and irritation relieved by suitable nervines. Such measures may hold the enlargement in check for a long time, when the difficulty will lead to no further inconvenience. When, however, it becomes decidedly troublesome, on account of its size, obliteration of the veins should be attempted. The patient having been directed to lie down and the varicose vessels having been emptied of their contents, the surgeon is to lift out the veins from the vas deferens, which may be distinguished from the other vessels by its hard and corded feeling. Curved pins may be then introduced under the veins, and sutures applied upon them externally, after the manner already directed for the treatment of varix (see page 490). This mode of procedure usually provokes swelling in the scrotum, and may be followed by suppuration. The patient should be kept quiet for a number of days, excitement relieved by pills of lobelia and boneset and the scrotum sustained in a bandage after the vessels have been obliterated. Another mode of procedure consists in passing a silver pin behind the veins and a silver wire in front of them, the pins entering and coming out at suitable slits through the skin and the vas deferens and artery not being included between them. Having thus fixed the wires, they are twisted over each other, or one is twisted around the other in such a manner as to strangulate the circulation through the vessels. This operation is chiefly practiced by the French surgeons and is generally favored by all operators. It effects the desired obliteration without much risk of provoking suppuration in the parts. The wires are allowed to remain till they slough away, when the edges of the sore are to be brought into apposition and the case managed according to the class of ulcer to which it belongs. It has been recommended to practice castration in these cases, and the patient himself is generally urgent for this procedure. The operation is nearly always fatal and should not be undertaken.

FIG. 95.



Strangulating Varicocele by twisting the Wire over the Pin.

Castration.—One or both testicles may require to be removed in consequence of malignant growths, or even of common non-malignant growths that have passed into a state of ulceration and threaten the destruction of the parts. It is sometimes advised in neuralgia of the testicles and in varicocele, but the surgeon is wholly unjustified in operating in these cases. The organ is removed by shaving the hair from the groin, lying the patient on his back and producing anesthesia, if necessary. The thighs should hang down over the end of the bed or table and the tissues of the scrotum made tense by grasping it in one hand. A longitudinal incision is then to be made directly through the scrotum from the external abdominal ring to the extreme lower portion of the sac. The attachments between the testes and the scrotum are to be severed by the scalpel. The veins of the spermatic cord should be then seized with the fingers and the parts severed. The artery may be tied before the cord is severed, or after it; but a ligature should never be put upon the vein. Great care must be taken not to allow the cord to slip within the abdominal ring till after its arteries have been properly ligated, and one end of the ligature is to be brought out of the wound so that the sloughing extremity of the vessels will afterward be under the control of the surgeon. But little pain is suffered after the parts have been cleansed and brought together, but the loose structure of the scrotum favors the establishment of erysipelatous inflammation and slight suppuration is not unlikely to ensue. In order to guard against this, the patient should be put upon the use of lobelia, with infusions of zinziber and eupatorium, an occasional vapor bath, and enemas and leptandra to regulate the action of the bowels. The operation is to be avoided whenever it is possible to do so, and the surgeon should never undertake this mutilation of the body except upon the most urgent occasions.

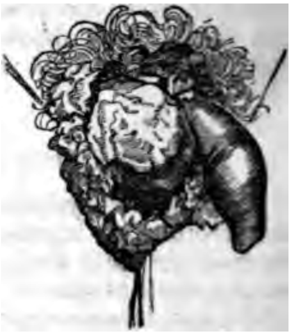
Affections of the Scrotum and Penis.

Erysipelas.—Erysipelatous excitement may be provoked in the scrotum by injuries to the parts, venereal excesses and alcoholic or other dissipations. The integuments swell enormously, soon become of a brown or tawny color and shriveled, a fetid and ichorous pus oozes from the surface and gangrene soon takes place. The destruction of tissues may extend upward into the groin, and even across the abdomen; and the patient manifests an irritative form of fever from the first and soon sinks into a typhoid condition. Such a state of things is evidently very serious and no moments are to be lost in treatment. Thorough and stimulating emetics are to be given at the rate of two or three a day and a vapor bath after each emetic; drinks of serpentaria, polemonium, zinziber and asarum, or eupatorium and capsicum, are to be pushed vigorously and the scrotum is to be enveloped in poultices of ulmus and lobelia, to which may be added small proportions of zinziber, capsicum, xanthoxylum, capsicum and myrrh, or other stimulants, as the nature of the case may demand. In short, the treatment already recommended for phlegmonous erysipelas is to be here pursued with all possible vigor; and mortification is to be met by stimulating applications, as in sloughing of other structures. The vesicles formed upon the surface are to be discharged by a small puncture as soon as they appear.

Edema.—Dropsy of the scrotum is not an uncommon difficulty, the swelling being enormous and occurring as a sequence of general anasarca or following upon checked perspiration or erysipelatous difficulties. There is seldom much inflammatory excitement, yet the tissues are slightly reddened and tense and sloughing soon takes place. The treatment is by incision in the mesial line of the integuments, followed by vapor baths, hydrastis, gentian and other tonics, eupatorium purpureum and chimaphila, to influence the kidneys, with warm clothing and the application of light bandages to the parts.

Cancer.—Cancerous difficulties are occasionally met with in the scrotum, generally following upon the lodgment of soot in the rugæ of the integuments and seldom appearing in any but chimney sweepers. Upon this account it has obtained the soubriquet of *chimney-sweeper's cancer.* The destruction generally extends over a large portion of the superficial textures, commencing as a red wart and soon sweeping off the scrotum by ulceration and sloughing. Fungous growths come out upon the surface of the sore and the decay of the tissues advances regularly toward the inguinal rings. Early and free excision of the parts seems to be the only mode of treatment available. The constitutional management already directed for cancer in general (see page 242) must be instituted at an early day; yet these parts seem but slightly amenable to the influences of this course of management. The knife has frequently been employed with success, and the danger from secondary cancer seems much less likely from extirpation of this part than from a similar procedure at any other part of the body.

FIG. 96.



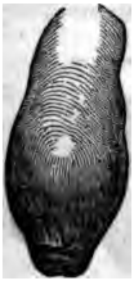
Chimney-Sweeper's Cancer.

Hypertrophy.—Hypertrophy of the scrotum, also called *elephantiasis,* is a rare affection, being limited almost entirely to inhabitants of tropical regions. The structures of the sac gradually thicken and form a tumor, which sometimes attains an enormous size. When its size becomes inconvenient, it is to be removed by the knife—an operation which is seldom serious except when the tumor is enormous in its dimensions and its blood vessels much dilated. Fatal hemorrhage may then ensue. Inguinal hernia may sometimes exist in connection with this enlargement, rendering excision of the scrotum improper. When the operation is performed, the surgeon should endeavor to leave enough of the integuments to cover the testes, which can usually be done without much difficulty.

Phymosis.—Phymosis signifies elongation of the prepuce with contraction of this covering over the neck of the glans.

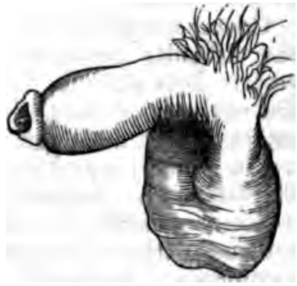
It may be either congenital or induced as an apparent sequence of venereal affections, or arise as an hypertrophy. When the contraction is great, it interferes with the enlargement of the glans, causes pain by compression, provokes suppuration of its mucous lining, impedes the passage of urine and may lead to stricture of the urethra. It is to be relieved by an operation, that of circumcision being generally preferred. The surgeon is to draw the elongated prepuce forward and then seize it with a pair of strong polypus forceps. An assistant holds the forceps while the surgeon seizes the extremity of the prepuce in his fingers and, at one sweep of the bistoury, excises all that portion of the integuments which is in front of the forceps. This excision, however, only removes the skin, the mucous membrane being still left adherent to the glans. A director is then introduced under this membrane, which is slit up with a pair of scissors, its edges trimmed off, the frenum severed and the edges of the wounds in the mucous membrane and in the skin brought together and held in position by four small sutures. There may be bleeding from the arteries of the integuments and these vessels will require ligation, even though they are small. The patient should then be kept quiet for a few days, when the two layers of tissue will unite and no further inconvenience be suffered. Other operators slit up the prepuce by inserting a director under it and passing a sharp pointed bistoury up the groove of this instrument and then making an incision through the integuments from opposite the crown of the glans to the extremity of the covering. This operation is much less effectual than the former one. Dr. Pancoast removes a V shaped portion of the prepuce, and this is sometimes a very successful mode of procedure. In some instances, however, especially where the integuments are simply swollen and elongated in consequence of venereal affections, no operation may be required. Quiet is to be enjoined upon the patient, the parts poulticed with lobelia and elm and the system relaxed by the use of lobelia and boneset pills, and such diuretics as arctium lappa, mentha and eupatoreum purpureum with althea, administered freely. A few days of such management may

FIG. 97.



Congenital Phymosis.

FIG. 98.

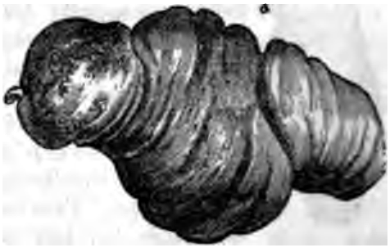


Venereal Phymosis.

restore the integuments to the normal condition. If the surgeon fails in this attempt, circumcision may be practiced as a last resort.

Paraphymosis.—In this difficulty, the prepuce is drawn behind the glans of the penis and there contracted, impeding the return circulation in the glans, provoking inflammatory action and ultimately leading to suppuration, unless the obstruction to the blood vessels is removed. Febrile excitement is not uncommonly provoked and there is marked irritability of the patient. The surgeon may attempt reduction by giving the patient a few drinks of lobelia in mentha, administering a mild vapor bath and then, while the tissues are in a relaxed condition, endeavoring to pull the prepuce forward at the same time that the glans is shoved backward. In recent cases, this mode of procedure seldom fails in effecting the desired end. When relief can not be thus obtained, however, the surgeon may pass a narrow scalpel under the prepuce and opposite the sulcus behind the glans; the prepuce is then to be slit up by one sweep of the knife, when relief will be immediately obtained. The edges of the skin and mucous membrane may then be brought together by sutures and the prepuce be allowed to heal in this open condition.

FIG. 99.



Paraphymosis—a. Sulcus behind the Glans.

Cancerous affections of the penis are occasionally met with, the difficulty being most commonly of the scirrhous character. It is attended by the usual fetid discharge and peculiar cachexy of the patient. Little can be done toward obtaining relief, although the treatment recommended for cancer in general may have an effect in staying the progress of the difficulty. Amputation is commonly recommended, and it seems possible to remove this organ, under these circumstances, without provoking a strong liability to secondary carcinoma. Amputation is generally performed by putting the penis gently upon the stretch and then cutting it off directly with the scalpel or a small amputating knife. The wound is then left to heal of itself, the patient being kept quiet and constriction of the urethra prevented by keeping a bougie of suitable dimensions in it. The amputation should always be performed near the pubes, yet not close enough to allow the stump to be retracted under the bones.

CHAPTER XXII.

AFFECTIONS OF THE FEMALE GENITALS.

Affections of the External Organs.

Blennorrhea.—This consists of a muco-purulent discharge from the vulva, accompanied by a light degree of inflammatory excitement, causing irritation of all the external genitals and being always associated with excoriation. It may be considered as a light ulceration of the mucous membrane, occurring most frequently in young persons and being readily relieved by attention to the prima via, cleanliness of the genitals, cold water enemas per vaginam, tepid bathing of the skin and tonics to regulate the digestive apparatus. When the difficulty advances and is disposed to pass upward through the vagina, or to destroy the tissues of the vulva deeply, astringent injections to the vagina are required. The patient may be confined to her back, the parts cleansed frequently and their surfaces kept separate by flexing the thighs upon the abdomen and throwing the knees apart. The bowels are generally found obstructed and they require injections, with small portions of leptandra, to unload them; the digestive apparatus may be foul, calling for an emetic, and the skin should always be attended to.

Noma.—This is a phagedenic ulceration of the labia, resembling cancrum oris. It begins in the form of small, soft, warty-looking enlargements, which increase slowly, provoke inflammatory excitement and heat in the parts, soon lead to an erysipelatous condition with vesications, cause difficulty in making water and quickly pass into an open phagedenic ulcer. The treatment should be of the same general character as that already directed for ulcers of this class (see page 181). Stimulating and relaxing medicaments must be used as washes to the vulva, emetics must be given every second or third day to relieve the system from morbific accumulations, vapor baths may be given after the emetics, and digestion may be aided by the use of such tonics as hydrastis, populus, etc. The difficulty is a very annoying one and requires pretty energetic treatment.

Abscess.—Abscesses may form in the vulva, as a direct sequence of injury of the parts or of erysipelatous affections. One or more purulent cysts may exist, arising either upon the labia or upon the inner edge of the vagina. Inflammatory excitement is provoked, there is a muco-purulent discharge from the vaginal surface, as well as from the vulva, and the patient complains of pain, sense of weight and tenderness. It is common in prostitutes, but may arise in children. The pus should be discharged by early incision, the parts kept clean and derangement of the general health attended to in the manner that is appropriate to all other cases of abscess.

Thrombus.—This consists in extravasation of blood in one or both labia, which may enlarge considerably and lead to painful feelings, interfere with the passage of water and obstruct the descent of the fetus in cases of parturition. The coagula should be discharged by a small incision, the hemorrhage being relieved by applications of cold water, infusions of any of the astringents, or pressure.

Pruritus.—Inordinate and painful itchiness may be provoked in the vulva without any apparent cause; or it may follow upon leucorrhea, be accompanied with pregnancy and even be provoked by some forms of dry gonorrhea. The surface of the vulva becomes dry and papulæ may arise upon it. Although the difficulty is in itself slight, it frequently proves difficult of removal. When it is dependent upon pregnancy, gestation must be patiently waited for. If leucorrhea or gonorrhea provokes the difficulty, the primary affection must be treated according to the ordinary rules of medical practice. The bowels should be at all times attended to, being regularly unloaded with enemas of elm and lobelia, and a few small clysters of the same may be given each day and the patient directed to retain them. The parts themselves should be freely bathed with cold water, after which they may be smeared with an unguent of chalk and sweet oil, or cold cream.

Tumors.—The labia are occasionlly the seat of fatty tumors, which sometimes attain a large size. Encysted tumors, or wens, are also found on the same parts. In either case, the unnatural growth is to be removed by dissection, two elliptical incisions being taken for this purpose. When the tumor is small, however, one direct incision may be made and the tumor then dissected out. Hemorrhage may be stayed by the ordinary means, and the patient should be kept quiet for several days after the operation. Fleshy excresences are sometimes developed upon these parts, being very tender and strongly disposed to bleed. They are painful and extremely sensitive to the passage of urine. Excitement in them should be quieted by the means already directed for pruritus; and the excresences may be dissected out or cut off with the scissors.

Laceration of the Perineum.—The perineum is occasionally torn in severe parturition, either on account of the unusually large size of the child's head or by rough attempts at support on the part of the midwife. The only treatment usually required is cleanliness of the parts, a quiet position of the patient and abduction of the thighs to keep the edges of the wound approximated. Simple cold water dressings are all that are necessary. When the laceration is deep, however, the wound may be brought together by two or more quilled sutures, though it is generally improper to attempt to sew the parts by any form of ligature, as cleanliness and good approximation of the lacerated surfaces almost invariably secure healing of the wound.

Imperforate Hymen.—The hymen occasionally forms a firm septum in front of the vagina, denying exit to the catamenia and not admitting sexual intercourse in the adult and married. When the catemenia can not escape, they accumulate in great quantities, distend the abdomen, impede the flow of water and cause uneasiness in the uterine region. The imperforation is readily removed by a few touches of the bistoury, after which the vagina should be well syringed and the structures may be further dilated by sponge or elm tents.

Affections of the Vagina.

Prolapsus.—The walls of the vagina may become so redundant and relaxed as to fall downward in a prolapse more or less complete, the membranes of the canal sometimes protruding quite through the vulva. When the anterior wall is thus displaced, the bladder is likely to be coetaneously prolapsed, when the patient will suffer irritability of the whole urinary apparatus and may develop phosphatic sediment in urine. This form of the difficulty is called *cystocele.* When the posterior wall of the vagina is displaced (*rectocele*), the rectum bulges forward in a *cul de sac*, obstinate constipation is liable to follow and ulceration of the rectum may be ultimately induced. These difficulties are generally dependent upon a feeble state of the health and can usually be removed by a judicious course of tonics, baths followed by friction, enemas to maintain the natural action of the lower bowels, infusions of lappa major or eupatorium purpureum to relieve the kidneys, lobelia and ulmus drinks to soothe the nerves and lubricate the passages and vaginal clysters of geranium, hamamelis or similar mild astringents. Small quantities of myrrh will usually be found a valuable adjunct to the other agents. If these measures fail and the prolapsus continues decidedly inconvenient, contraction of the vaginal walls may be secured by touching them with caustic and then leaving them to cicatrize. A perferable procedure, however, consists in pinching up a portion of the redundant tissue and then excising it with a pair of scissors or by two elliptical incisions with a bistoury. The edges of the wound may be then brought together by a few interrupted sutures and granulation favored by keeping the parts clean and sustaining the system by tonics. When this operation is performed, the surgeon should endeavor to remove a portion of the structures from each side of the canal, which is preferable to removing it all from one side. If the bladder is strongly prolapsed or the rectum has formed a prominent *cul de sac*, the operation should not be attempted.

Foreign Bodies.—The surgeon is sometimes called to remove foreign bodies that have been crowded into the vagina by the patient herself or by some ill-disposed person. The patient is to be placed upon her back and the genitals well lubricated with sweet oil, after which attempts may be made to dilate the canal by the fingers. Care and perseverance are usually crowned with success, when a pair of long forceps may be made to grasp the solid, which is to be removed by gentle and steady traction. If these attempts fail, and the solid is so dense that it can not be either cut or bored into, no alternative is left but to sever the sphincter, when the offending substance can be removed easily. The wound is then managed as a case of ruptured perineum.

Fistulæ.—Fistulæ may be formed between the vagina and rectum, or between the vagina and urinary organs, as a sequence of sloughing induced by pressure upon these parts during parturition or provoked by that inhuman use of obstetrical instruments that has so long characterized a meddlesome portion of the profession. They may result in sloughing, induced by occlusion of the rectum or urethra, and are sometimes met with as sequences of carcinomatous destruction of the recto-vaginal septum.

In cases of urethro or vesico-vaginal fistulæ, the urine dribbles away slowly through the vagina, escaping almost as soon as it is discharged by the ureters. As a consequence, the external genitals are continually excoriated, the patient suffers burning sensations at these parts and a strong ammoniacal odor renders her unbearable almost to herself. The health is likely to be undermined and there is always very great despondency, induced by the unfortunate condition of the parts. In recto-vaginal fistula, flatus and feces are likely to escape into the genital passage and be voided in this way instead of by the natural channel. This is a cause of serious annoyance to the patient and is not unlikely to provoke ulceration of the vagina, with consequent loss of health. Sometimes both septa are torn through, when urine and feces escape together through the vagina. When the rupture is sudden and extensive, carelessness in after management may allow the granulations to bind the walls of the vagina together; and thus contraction of this part becomes associated with the fistula, rendering the case doubly difficult.

Upon the occurrence of either of these accidents, an attempt must be immediately made to bring the edges of the ruptured parts together with the idea of favoring their union. The patient having been laid upon her back and the thighs flexed, the vagina is dilated by a bivalve speculum and the site of the fistula brought to view. By means of a curved needle held in a pair of suitable forceps (as in the operation for cleft palate), sutures of very fine annealed silver wire are passed through the lips of the wound, at the distance of about one-fourth of an inch from the edge, and in such a manner as not to puncture the mucous membrane of either the bladder or the rectum. One, two or more sutures having been introduced in this way, one end of each is to be brought through a hole in a small bar of lead, or a silver tube, which has been previously prepared and which should be a little longer than the fistula. Over the end of each suture a small perforated shot is to be passed and the wire firmly clamped down upon it. The sutures are then drawn tightly and the metallic bar brought into position against the integuments. The proximal extremity of each suture is then to be passed through another silver tube or leaden bar, and clamped over a small perforated shot in the same manner as before. This variety of the quilled or clamped suture was introduced by Dr. Sims, of Alabama. It serves an excellent purpose in bringing the edges of the fistula together as completely as may be deemed prudent without endangering the strangulation of the parts. After the sutures have been adjusted, the patient is to be laid upon her back and directed to keep as quiet as possible. The bowels should not be unloaded for several days in cases of recto-vaginal fistula, and a catheter should be worn in the urethra in cases of urethro-vaginal fistula. The diet should be light and several days should be allowed to pass before the parts are disturbed, even for the purpose of making an examination. When the case is quite recent and the patient's strength has not been prostrated by the continuousness of the loathsome condition, this operation is not uncommonly successful. In long standing cases, the same procedure is adopted, the edges of the fistula being denuded before the sutures are applied. The chances of success in these cases are fewer than in more recent cases; but the fistulæ have been ultimately closed, the operation being repeated five, six and (in one case) twenty times.

Dr. Boseman, of Alabama, has recently introduced what he calls the *button* suture for these cases. It consists in a flat piece of metal, varying in size from one-half an inch to an inch, perforated with two holes at points opposite each other and equi-distant from the center to the circumference. The suture of annealed wire having been passed through the edges of the wound, an extremity of the ligature is brought through each perforation in the button and then clamped as tightly as may be deemed proper. This mode of procedure maintains the parts in very close apposition, is not likely to require more than one suture and even that suture need not be drawn as tightly as in the operation by the clamped suture of Dr. Sims. Dr. Boseman's procedure promises to be of much advantage in the treatment of these cases.

In obstinate cases of recto-vaginal fistula, after the above operations have failed, success has been obtained by severing the sphincter and the walls of the rectum, leaving the walls of the vagina entire. By this procedure, a large sac is formed in front of the rectum into which the feces pass in preference to passing through the vaginal fistula. The latter opening then remaining unirritated, may be successfully treated by denuding its edges and applying sutures as above, after which the incision of the sphincter may be healed up as in an ordinary case of fistula in ano. Small fistulæ at this site are sometimes treated successfully by touching their angles with lunar caustic or a red hot wire. The act of cicatrization draws the parts together and, by repeating the escharotic application at intervals of from two to three weeks, the parts may be closed up line by line and the difficulty ultimately remedied.

When all means of surgical procedure have failed in the treatment of these cases, little remains to the patient but to keep herself as cleanly as possible. In ruptures of the bladder, as also in recto-vaginal fistulæ situated high up in the vagina, it has been recommended to fill this latter canal with a suitable India-rubber sac, provided with a stop-cock, which is to be filled with air after it is introduced. This bag adjusts itself snugly to the form of the canal and prevents the passage of both urine and feces into it. It may be removed once or twice a day and the vagina well cleansed by suitable injections; afterward, the India-rubber sac is again introduced.

Sometimes vesico-vaginal fistulæ heal up to within a very small size, in which cases the annoyance of dribbling water may be prevented by introducing a catheter every second or third hour, thus drawing off the accumulated urine before it fills the bladder up to the point of the opening. The health, in all these cases, is to be carefully maintained by that course of management which is indicated in particular cases.

Stricture.—The vagina occasionally becomes contracted by the formation of cartilaginous rings in its walls. The contraction may be but slight, or it may be so great as to almost obstruct the passage of the catamenia and entirely prevent sexual intercourse. When the stricture is sufficiently great to prove annoying, it may be relieved by incising the rings with a small probe-pointed bistoury, using the finger as a director.

Atresia Vagina.—The surgeon may meet with rare cases in which the vaginal canal has become almost entirely obliterated, either in consequence of injury during parturition or of plastic deposits following upon ulceration. The obstruction may extend from the orifice of the urethra almost to the cervix of the uterus, but is generally limited to the extent of about one-half an inch, beginning at a distance of three-fourths of an inch above the external urinary passage. In overcoming this obstruction, the patient is to be laid upon her back, a catheter introduced into the urethra and the finger insinuated in the rectum to serve as guides in the use of the knife and to obviate the possibility of wounding the bowel or urethra. The dissection of the parts is then to be proceeded with carefully, a probe-pointed bistoury being used for the purpose and the cartilaginous rings being incised at their sides.

Affections of the Uterus.

Ulceration.—Ulceration of the cervix uteri, or even within the cavity of the uterus, may be provoked by injury to the parts or by degenerated leucorrheal discharge, or arise spontaneously as a result of too frequent sexual intercourse in persons of feeble habits. The ulcers may present any of the varieties already described in the chapter on this subject, being indolent, irritable, weak or healthy, according to the recuperative power of the patient's system. The discharge is usually very fetid, and is abundant or small according to the character of the ulcer. When the sore continues unhealed, the patient's health usually becomes undermined and the parts are commonly very irritable. The nature of the difficulty can be easily detected by an examination with the speculum. After a full investigation of the case has been once made, the surgeon should never be tempted to the frequent repetition of the examination. These cases are best treated by syringing the vagina frequently, tepid water being used when the ulcer is simple, infusions of hamamelis, quercus or geranium, when the ulcer is weak, diluted tincture of myrrh when the sore is decidedly indolent, and ulmus, althea and similar demulcents, when the parts are very irritable. These cases are almost invariably connected with a bad state of health throughout the system, and the surgeon cannot expect to have the sores heal under any system of local treatment, however judicious it may be. The stomach must be righted (an emetic being given once a week or once in two weeks as different cases may require) and the organ strengthened by the use of hydrastis, populus, sabbatia, aletris and similar tonics. The lower bowels must be regularly unloaded by suitable enemata, while the upper bowels and hepatic apparatus are relieved by the use of leptandra or apocynum. Tepid baths, followed by friction, are to be employed each day, and a vapor bath may be directed after each emetic. Under such a course of management, these sores will invariably heal in the course of a short time and no caustic preparations whatever need be applied to the ulcers.

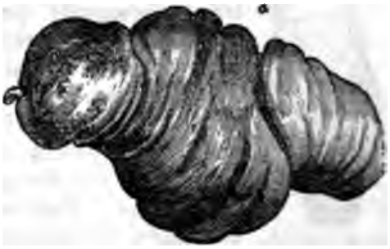
Stricture of the Cervix.—The cervix uteri may be occluded by the formation of a membranous septum following as a sequence of inflammatory excitement; or the plastic exudations may be poured out through the substance of the organ and cause occlusion of the orifice by simple induration of the parts. The stricture may be congenital or it may be developed in adult life. The menses are necessarily obstructed and painful symptoms of dysmenorrhea manifest themselves. The difficulty can usually be overcome by dilating the cervix with bougies, after the manner directed in strictures of the urethra. In some cases, especially where the formation of a septum is the cause of occlusion, a small incision may be made by a curved bistoury.

Polypi.—Uterine polypi may form at any point within the organ, being most frequently situated near its fundus, but sometimes extending to the cervix and even springing from the folds of the vagina. They may be of the mucous variety and strongly disposed to bleed, or fibrous in their structure, pedunculate in form and not so much inclined to hemorrhage. Sometimes they are of but very small size, and so sessile with the wall of the organ as to be scarcely distinguishable; but again they may attain an enormous size, be attached to the uterus by a peduncle several inches in length and fall downward even to the mouth of the vagina. Their growth is generally slow and their presence usually indicated by frequent and irregular tendencies to hemorrhage. There is also a muco-purulent discharge at the same time, and the loss of blood may lead to general anemia. When the tumor reaches the vagina, it is easy to distinguish it by the finger; when it remains entirely within the uterus, especially when it is sessile in its attachment, the true nature of the difficulty may be unsuspected or, when suspected, cannot be determined except by the aid of the speculum. Even then it is sometimes difficult for the surgeon to satisfy his mind that the case is not one of prolapsed fundus. The latter difficulty can generally be known from the fact that the surface of the enlargement is rough, of a dark color and causes a sickly sensation upon being handled, whereas polypi are generally covered with a soft mucous coat (under which there may be nodules) and one not particularly sensitive to the feeling. Polypi do not bleed readily when handled, whereas the inverted uterus does. These difficulties do not become immediately serious in themselves, but they always enfeeble the patient by the persistent loss of blood, cause a dragging sensation in the parts and are liable to become ulcerated and lead to a very fetid and excoriating discharge.

Two modes are adopted in removing these enlargements, namely, by direct incision and by ligature. The first procedure is generally preferable. The patient is laid upon her back and the thighs flexed as for lithotomy, the region of the tumor is brought to view by the aid of the speculum and a pair of long-bladed angular scissors are then introduced to the region of the polypus and the growth excised at a distance varying from half an inch to three-fourths of an inch from the uterine walls. Very little bleeding is caused and the difficulty is usually remedied at once. When the attachment to the uterus is broad, however, it may be necessary to remove the tumor by incisions with the bistoury. In such cases, the tissue should be incised at a safe distance from the uterine walls; for injury to the latter parts would be likely to be followed by serious consequences, while any portions of the tumor that may be left behind will quickly disappear by suppuration. The use of the ligature is only applicable to pedunculated tumors where the base is rather broad. It is applied by slipping a noose of annealed wire, or of whip-cord, over the peduncle, bringing the extremities of the ligature through the tubes of a double canula and then tightening the inner end of the canula against the pedicle by wrapping the ligature restore the integuments to the normal condition. If the surgeon fails in this attempt, circumcision may be practiced as a last resort.

Paraphymosis.—In this difficulty, the prepuce is drawn behind the glans of the penis and there contracted, impeding the return circulation in the glans, provoking inflammatory action and ultimately leading to suppuration, unless the obstruction to the blood vessels is removed. Febrile excitement is not uncommonly provoked and there is marked irritability of the patient. The surgeon may attempt reduction by giving the patient a few drinks of lobelia in mentha, administering a mild vapor bath and then, while the tissues are in a relaxed condition, endeavoring to pull the prepuce forward at the same time that the glans is shoved backward. In recent cases, this mode of procedure seldom fails in effecting the desired end. When relief can not be thus obtained, however, the surgeon may pass a narrow scalpel under the prepuce and opposite the sulcus behind the glans; the prepuce is then to be slit up by one sweep of the knife, when relief will be immediately obtained. The edges of the skin and mucous membrane may then be brought together by sutures and the prepuce be allowed to heal in this open condition.

FIG. 99.



Paraphymosis—*a.* Sulcus behind the Glans.

Cancerous affections of the penis are occasionally met with, the difficulty being most commonly of the scirrhous character. It is attended by the usual fetid discharge and peculiar cachexy of the patient. Little can be done toward obtaining relief, although the treatment recommended for cancer in general may have an effect in staying the progress of the difficulty. Amputation is commonly recommended, and it seems possible to remove this organ, under these circumstances, without provoking a strong liability to secondary carcinoma. Amputation is generally performed by putting the penis gently upon the stretch and then cutting it off directly with the scalpel or a small amputating knife. The wound is then left to heal of itself, the patient being kept quiet and constriction of the urethra prevented by keeping a bougie of suitable dimensions in it. The amputation should always be performed near the pubes, yet not close enough to allow the stump to be retracted under the bones.

CHAPTER XXII.

AFFECTIONS OF THE FEMALE GENITALS.

Affections of the External Organs.

Blennorrhea.—This consists of a muco-purulent discharge from the vulva, accompanied by a light degree of inflammatory excitement, causing irritation of all the external genitals and being always associated with excoriation. It may be considered as a light ulceration of the mucous membrane, occurring most frequently in young persons and being readily relieved by attention to the prima via, cleanliness of the genitals, cold water enemas per vaginam, tepid bathing of the skin and tonics to regulate the digestive apparatus. When the difficulty advances and is disposed to pass upward through the vagina, or to destroy the tissues of the vulva deeply, astringent injections to the vagina are required. The patient may be confined to her back, the parts cleansed frequently and their surfaces kept separate by flexing the thighs upon the abdomen and throwing the knees apart. The bowels are generally found obstructed and they require injections, with small portions of leptandra, to unload them; the digestive apparatus may be foul, calling for an emetic, and the skin should always be attended to.

Noma.—This is a phagedenic ulceration of the labia, resembling cancrum oris. It begins in the form of small, soft, warty-looking enlargements, which increase slowly, provoke inflammatory excitement and heat in the parts, soon lead to an erysipelatous condition with vesications, cause difficulty in making water and quickly pass into an open phagedenic ulcer. The treatment should be of the same general character as that already directed for ulcers of this class (see page 181). Stimulating and relaxing medicaments must be used as washes to the vulva, emetics must be given every second or third day to relieve the system from morbific accumulations, vapor baths may be given after the emetics, and digestion may be aided by the use of such tonics as hydrastis, populus, etc. The difficulty is a very annoying one and requires pretty energetic treatment.

Abscess.—Abscesses may form in the vulva, as a direct sequence of injury of the parts or of erysipelatous affections. One or more purulent cysts may exist, arising either upon the labia or upon the inner edge of the vagina. Inflammatory excitement is provoked, there is a muco-purulent disbe lanced freely. The pus is then to be pressed out gradually, the edges of the wound kept open to allow the escape of new purulent material that may be formed in the cavity, the bowels are to be regulated by enemas and suitable aperients, the foulness of the stomach promptly relieved by emetics, digestion aided by the use of tonics, tepid sponge baths advised daily and a vapor bath directed occasionally. Under vigorous treatment of this kind, these abscesses will be limited in size and heal up rapidly after their contents have been evacuated. Carelessness, however, may allow the abscess to attain an enormous size and reparation will proceed slowly, even if several other abscesses do not form in consequence of neglect.

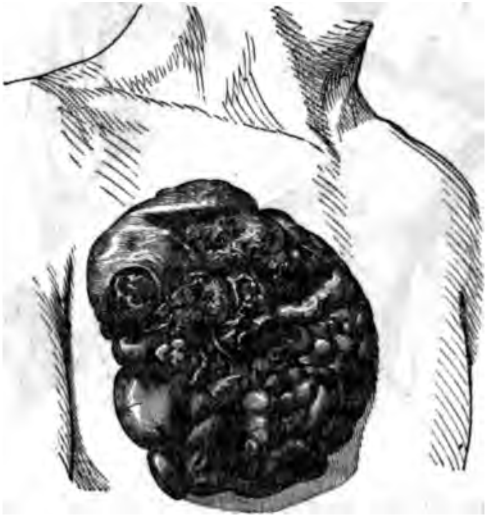
Excoriated Nipples.—The nipples very commonly become chapped and ulcerated in consequence of suckling, particularly after first births. The careful midwife will guard against this difficulty by timely advice to the patient, directing her to keep the nipples dry and well protected. When ulcers form, they are always extremely painful. Simple sores may be managed by cleanliness, poultices of slippery elm or unguent of cold cream; when the sore is of the irritable cast, slippery elm and lobelia poultices if there is much heat in the parts; and washes of geranium, quercus or hamamelis, when the sore is disposed to fungate or bleed. In consequence of the child's nursing frequently, these parts are liable to remain sore for sometime; and although the difficulty is in itself a small one, it is so painful as to prove extremely exhausting to the patient and hence demands the early attention of the midwife.

Hydatids.—Cysts filled with a thin serum occasionally form upon the surface of the mammæ, appearing like small bladders. They may be numerous; can be readily detected when superficial, but may be difficult of diagnosis when deeply seated; are liable to provoke low inflammatory excitement in the part and are usually painful at the menstrual periods. The cysts may be punctured and their contents evacuated, the health of the patient being at the same time sustained by vigorous tonic and alterant treatment and close attention to the skin, bowels and digestive organs. It has been recommended to extirpate the gland in severe cases, but this course of treatment is quite unjustifiable.

Tumors.—Fibrous tumors, or those of a fatty nature, are not uncommonly developed in the breasts, occupying a small portion of the gland or engaging the whole of it. They enlarge persistently and may attain a considerable size. When the circulation in the part becomes strangulated, the surface necessarily ulcerates; but it is seldom that the difficulty attains to this degree of obstinacy. No mode of management is applicable except to remove the parts by free elliptical incisions, as will be presently mentioned.

Cancer.—The breasts seem to be favorite sites for the development of carcinomatous tumors, females being thus affected at any age from that of puberty to adult life. The scirrhous form of cancer most commonly appears in those who are advanced in life, growing slowly, presenting a hard and uneven surface, being usually circumscribed and rather movable under the skin. It swells, ulcerates early, is not painful, but advances persistently till the whole organ is occupied by it. The enlargement may reach toward the axillæ, extend downward and become fast to the pectoral muscles and even affect the vessels of the neck, causing the arm to become edematous and water to be infused into the chest. Encephaloma is more rarely developed in this organ, but when it does appear it advances very rapidly, is extremely painful, generally presents a lobulated surface, is slightly elastic, ulcerates speedily and forms a large fungating surface. The scirrhous form of cancer seems to be more amenable to treatment in this locality than in any other; but encephaloma is scarcely curable by any means. When medical treatment is undertaken, it is to be in all respects the same as that which has been directed for cancer in general. When the difficulty is confined to a small portion of the gland and seems pretty

FIG. 100.

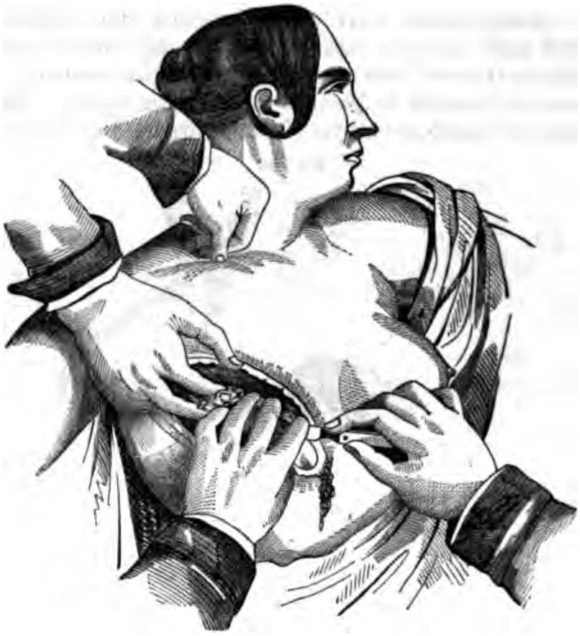


Fungating Encephaloma of Breast.

distinctly circumscribed, extirpation of the part, when practiced early, may save life.

Extirpation of the Breast.—Extirpation of the whole or a part of one of the mammæ may be called for by the development of either simple or malignant tumors. In performing it, the surgeon seats his patient in a chair and has an assistant hold the arm outward in order to bring the pectoral muscles to a state of tension. Two elliptical incisions are then made, one extending from toward the axillæ downward along the lower border of the pectoralis major and another upon the upper side of the nipple. The gland is then carefully dissected out down to the pectoralis muscle. The part is then to be sponged out, all bleeding vessels are to be secured and injured shreds of the cellular tissue or muscular fiber are to be cleared away, after which the edges of the wound may be brought into position and retained by adhesive straps. The patient is to be kept quiet for several days, the wound cleansed as often as its condition seems to render it necessary and granulation from the bottom of the cavity favored.

FIG. 101.



Extirpation of the Breast.

CHAPTER XXIII.

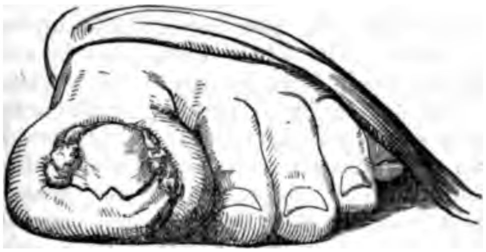
AFFECTIONS OF THE EXTREMITIES.

Affections of the Upper Extremities.

Ganglia.—Sinewy wens or collections of glairy fluid under the thecæ may form upon the wrist, the back of the hand or under the tendons of the forearm. They form a soft swelling, which suffers no pain, but causes slight inconvenience. They may be removed by dissection or evacuated by incision; but when they are situated under the tendons of the muscles, their removal may be followed by stiffness of the parts and the patient be worse off than before the wens were touched.

Onychia.—This difficulty consists in malignant ulceration, occurring about the roots of the nails, affecting either the fingers or the toes. The parts are excoriated, discharge a thin, fetid ichor, a small quantity of blood may be mixed up with the pus, the sore itself looks of a dusky color, the pain is very great, the bones seem to be affected, the nail is ultimately separated and comes off and the sore partakes of the characteristics of phagedena. In treating these cases, the parts of the nail which are left are to be taken away, the sore is then to be poulticed with ulmus and lobelia when the case is a simple one, capsicum, xanthoxylum or myrrh being added when the ulcer is truly phagedenic, and other medicaments being employed according to the varying conditions of the parts. The surgeon is to be directed by the ordinary principles already laid down in the chapter on *Ulceration.* In severe cases, the sore seems to partake of a malignant character and its advancement can not be arrested by medication. The surgeon is then under the necessity of removing the parts by amputation.

FIG. 102.



Onychia of the Great Toe.

Inversion of the Nails.—The toe-nails and, in rare cases, the nails of the fingers may grow downward into the flesh, compression upon their extremities interfering with their development. The pressure of the nail upon the skin usually leads to ulceration of the parts, which become swollen and inflamed and are extremely painful. Fungous granules spring up around the nail, which seems imbedded in the protruding sore. These cases can not be relieved except by removing the offending part. The edge of the nail is to be slit off and extracted from the flesh into which it has grown. The operation is in itself a small one, but a most fearfully painful one; hence the surgeon must study the position of the parts, determine carefully at what point to introduce his knife and then proceed with the operation with all possible expertness. After this, the sore is to be treated according to the class of ulcer to which it belongs.

Whitlow—Paronychia.—Whitlows or felons, are common upon the fingers, especially of those who use their hands much. The difficulty begins with a stinging pain, the part becomes red and swollen, the purple of congestion follows and suppuration ultimately ensues. When the accumulation of pus is under the skin, it points early and may be relieved within a few days after the commencement of the difficulty. The pain becomes more severe, the swelling greater and constitutional disturbance more marked as the abscess forms more deeply in the tissues; and when the pus accumulates under the thecæ, the agony is great. The whole hand may be engaged in the inflammatory excitement, phlegmonous erysipelas may be developed through a large portion of the arm, the health fails materially and the patient becomes exhausted. There is no respite from the suffering and the thecæ bind the pus down so firmly that there is no chance for its escape; hence suppuration may advance under the fascia and burrow extensively in front of the metacarpal bones. The only resource in such cases is to make a deep incision at an early day; for poultices and similar applications, however judiciously they may be advised, are seldom of any moment in relieving the misery. They are, however, to be used steadily, for they keep the parts in a more pliant condition and may avert the sequence of erysipelas or even aid in saving the phalanges from necrosis—an event that sometimes supervenes upon long retention of the pus.

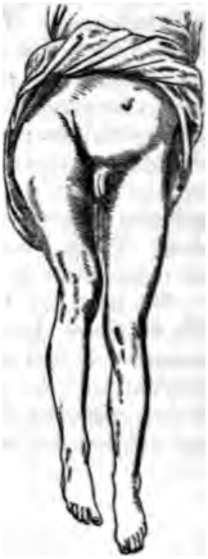
Contraction of the Fascia.—The aponeurosis of the palmar fascia may be contracted over the whole or through a part of its extent. The fingers are, as a consequence, bent and rendered almost useless. The difficulty may be congenital or provoked by injuries to the hand at any period of life. In the latter cases, it seems to depend upon thickening of the aponeurosis by plastic effusions. Relief can seldom be obtained except by severing the fascia through the affected parts and then straightening the fingers by splints. The skin is sometimes contracted and the fingers distorted during cicatrization after burns. Treatment is unsatisfactory.

Tumors.—Various bony tumors are liable to appear around the finger joints, as exostosis, osteo-cystoma, and especially enchondroma. The nature, diagnosis and management of these difficulties have already been sufficiently discussed in the chapter on the *Periosteum* and *Bones*, to which the student is referred. Carcinoma occasionally affects these parts, and scrofulous necrosis is not an uncommon difficulty among children. Supernumerary fingers are sometimes found growing upon the hand, being united to the natural fingers by ordinary tissues, no articulating surfaces existing between them. They are readily removed by amputation. The fingers are sometimes webbed, a difficulty which is readily removed by dividing the bands and placing pledgets of lint or oiled silk between them to prevent their reunion. The fingers may become webbed or attached during the cicatrization of burns. Prevention here is far better than cure, yet the deformity may be overcome by dividing the parts and treating as for congenital webbed fingers.

Affections of the Lower Extremities.

Morbus Coxarius.—Morbus coxarius, or hip disease, is a scrofulous affection implicating the head of the femur and leading to chronic disorganization of all the structures of the joint. It rarely affects any but those who are of a markedly scrofulous diathesis, in whom it may begin at any period of life. It usually commences by an uneasy feeling in the part, which may last for several weeks without any material change being noticed. The patient is lame, suffers pain when he attempts to walk, loses his appetite and becomes emaciated. Inflammatory excitement of a low degree is established in the parts, but is seldom successful in preventing suppuration. The cartilages, synovial membranes and bones, slowly pass into decay. As the synovial membrane becomes affected, inflammatory excitement is more ardent. The bone crumbles away by degrees, the whole acetabulum may be obliterated and the entire head of the femur destroyed. During all this time there is little external evidence of the mischief that is going on. The purulent material accumulates gradually, fluctuation is ultimately perceived, the pus finds its way downward and the abscess may be noticed along the course of the thigh. As the acetabulum becomes obliterated, the head of the femur is liable to slip up upon the dorsum of the ilium and the limb is thus shortened. The abscess will ultimately discharge upon the surface by one or more openings, which ultimately become fistulous. The hectic of exhaustive suppuration is soon established and death is strongly probable. This is the usual course of the disease.

FIG. 103.



Shortening of the limb and deformity of the hip in advanced Morbus Coxarius.

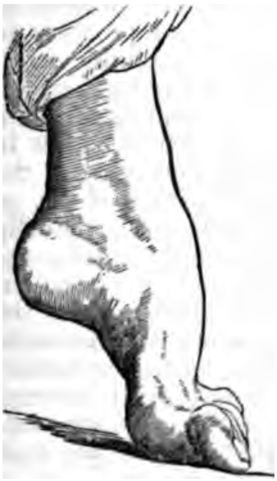
When the difficulty has advanced to a point where the abscess can be distinctly felt, or to where the limb becomes shortened in consequence of the disintegration of the rim of the acetabulum, the nature of the difficulty is very plain. During the earlier days of the difficulty, however, the symptoms are more obscure; the patient complains of undefined pain through the knee and thigh, drags the limb after him as he walks, is indisposed to move and the affected limb shows a decided shrinking and softening. The patient prefers to throw the heels apart and their approximation causes pain, the hip is flattened by atrophy of the glutei, the fold of the nates is nearly obliterated and the limb appears rather longer than its fellow. By jarring the patient or forcibly carrying the thigh outward, decided pain in the hip will be felt. Rotation of the limb also causes an increase of the misery, and the patient cannot bear to be tapped on the knee or the sole of the foot or over the trochanter major. The groin feels tender and pressure behind the trochanter causes uneasiness.

TREATMENT.—When morbus coxarius is suspected to exist, the patient must be put upon that course of treatment which has been already advised for *Necrosis* and *White Swelling*. Thorough emetics every day and a vapor bath after each emetic, stimulating alterants without limit and large poultices of ulmus and lobelia seed around the joint, constitute the chief means of relief. These processes depurate the system rapidly and eliminate the strumous material, which is otherwise likely to be deposited in the joint and may thus arrest the progress of the disintegration. If an abscess forms, it is to be opened at its most pendent portion and discharged carefully through a canula. Invigorating treatment is then to be kept up, tonics are to be given to improve the digestion, the bowels kept soluble and irritability is to be relieved by pills of boneset and lobelia. The systemic excitement is sometimes so
]

great that enormous quantities of these pills may be required to preserve an ordinary degree of relaxation. If disintegration has advanced so far as to lead to necrosis of the bone, with fistulous openings upon the surface, the same course of management is to be vigorously pursued. The parts are to be kept clean and well poulticed and the alterants and baths are to be depended upon. Emetics may not *seem* to be necessary, but the surgeon should not be deceived by appearance of the tongue; for no single measure has ever yet been employed that is as effectual as this in procuring a revulsion of the system and the ejection of morbific materials. These cases are of a very tedious nature and from one to two years of thorough treatment may be required to stay the progress of disintegration after the fistulæ have once formed. If the case is taken early, from six to twelve weeks may suffice to relieve the parts and effect a cure. Under this course of management, it is not uncommon to have these cases effectually remedied. These means are capable of effecting this end after all other means have failed, but he who would accomplish this good result must labor with an untiring hand.

Sometimes disintegration of the parts is so great, and the head of the femur is so far destroyed, that the use of the joint can never be restored. If the progress of destruction can be checked by the above measures, the femur usually impinges against the ilium, in which position it becomes anchylosed. When the surgeon has reason to suspect this termination of the case, he should keep the patient quiet and the limb fixed to its natural length in order that there may not be shortening and deformity after the anchylosis has been created.

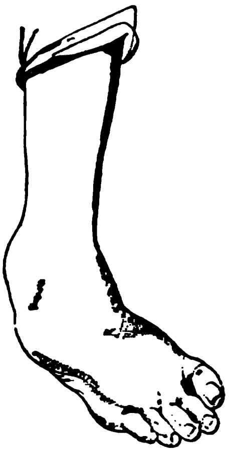
FIG. 104.



Talipes Equinus.

Club Foot—Talipes.—This congenital deformity of the feet depends upon undue shortness of the muscles of the limb, by which the foot is thrown into an unnatural position and the bones ultimately changed in their structure in order to accommodate themselves to the new relations of the parts. The most common variety of this deformity is that known as *talipes equinus*, in which the soleus and gastrocnemius muscles are shortened, the heel being raised up and the patient walking upon the ball of the toes. In *talipes varus*, the foot is thrown inward and its outer edge rather downward, the abductor muscles being contracted and the weight being borne upon the outer edge of the foot. This variety is also very common. In a few rare instances, the abductor muscles are contracted, the foot is rotated outward, the patient resting upon the inside of the inner ankle and the outer edge of the foot being thrown slightly upward. This is known as *talipes valgus*, the peronei muscles being chiefly at fault. *Talipes calcaneus* is a rare variety in which the toes are thrown strongly upward, the heel alone being brought to the ground.

FIG. 106.



Talipes Varus.

When the difficulty is but slightly developed, the member may be gradually straightened by accustoming the child to use shoes so arranged as to exert a gentle mechanical pressure in a direction opposite to that in which the deformity has occurred. The pressure should be carefully regulated so as not to irritate the child. Due perseverance may relieve many of these cases. When the deformity is considerable and the case a long standing one, tenotomy is to be practiced. In concluding upon this procedure, the surgeon first determines what particular tendons are to be severed and proceeds to their division by introducing a small tenotomy knife under the skin and then bringing its edge against the tendon and separating its fibers at one stroke. The wound in the skin should be as small as possible and the foot should be left in its old position for a few hours after the performance of the operation, the external wound being closed with a pleget of lint with collodion upon it. The foot is to be then gradually brought to a natural position and held there by suitable apparatus. Plastic exudations are thrown out upon the cut surfaces of the tendon; these are shortly molded into new tissue and from one to three inches of tendon may be thus made, the union being in all respects firm and the patient ultimately recovering the use of the limb, suffering only slight inconvenience till such time as the bones are able to accommodate themselves to the new positions of the parts. In talipes equinus, the tendo achillis is severed about an inch above its insertion into the calcaneum. In talipes varus, the tendo achillis is divided as before, the tibialis posticus divided above the ankle and the flexor longus pollicis may also need to be severed. In talipes valgus, the peroneus longus and brevis may be severed above the external malleolus; while in talipes calcaneus, the tibialis anticus is severed in front of the ankle. Other muscles may require to be severed in all these cases, more than one being generally engaged in producing the deformity. This the surgeon must determine for himself according to the case in hand. It is astonishing, at times, to witness what unsightly deformities of this kind can be cured by this very simple operation.

Weak Ankles.—Scrofulous children are occasionally troubled with weakness of the ankles, the ligaments being loose and relaxed, the foot turning inward or outward when the patient undertakes to walk and shaking around almost as if it had no connection with the bones of the foreleg. It may result entirely from scrofulous degeneracy, or may be induced by putting a child to a too early use of its limbs. In treatment, the patient should wear shoes with steel joints at their sides extending up the legs; the system should be relieved from scrofulous impurities by a thorough course of alterative medication, with vegetable diet and plenty of out-door enjoyment; while the ankle itself may be strengthened by the use of liniments composed mainly of tincture of lobelia with oils of absinthium, abies and similar agents.

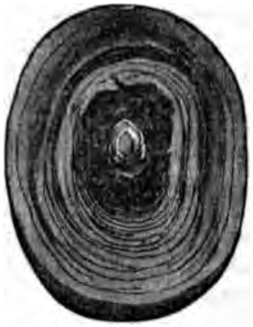
CHAPTER XXIV.

CALCULOUS AFFECTIONS.

Development of Calculi.

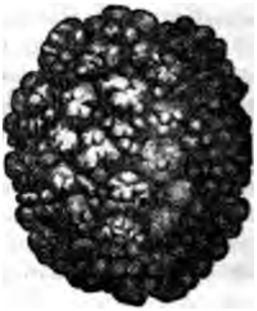
SOME persons seem by nature disposed to have earthy sediments form in the urine. These sediments may be voided many years without occasioning any material difficulty to the patient, who seems to enjoy ordinary health; but as life advances, or as the system becomes enfeebled and the renal and cystic circulation becomes obstructed, the materials of the sediment may accumulate in either the kidney, the bladder or the urethra, and form a solid mass known as *calculus* or *stone*. These calculi may occur singly or in great numbers, and may vary in size from a pin's head to that of a bean or a butternut or a lemon. Their formation may take place suddenly, or they may be developed slowly. Three general varieties are noticed in their composition: *First*, *Lithic acid*, which occurs most frequently in plethoric persons who have lived high and suffered from gastric irritability. The deposit in the urine is then either brickdust colored or of a yellowish tinge. The urine itself is scanty and the calculus, when formed, seldom attains a large size, is usually oval and presents a brownish red surface, may be either smooth or tuberculated and has a concentric arrangement. *Second*, The *oxalate of lime* calculus. This is, perhaps, the most common variety, appearing most frequently in nervous individuals and in those who have suffered exhaustion either through the mind or in consequence of venereal excesses. It is always accompanied by acidity of the stomach and disturbed sleep, and the urine is pale, profuse and voided with slight smarting. There is seldom a distinct sediment, but the crystals remain floating in the urine, subsiding after a time. The calculi formed by the association of these crystals may attain a considerable size, are distinctly tuberculated upon their surfaces and are known as the *mulberry calculi*. Sometimes the oxalate of lime forms numerous very small calculi, which the patient voids from time to time with slight irritability in the course of the urethra. *Third*, The *phosphatic calculi*. These are very common, occurring in nervous patients, particularly in those whose pursuits are chiefly mental. The urine is always pale and copious, has a sickly smell, decomposes rapidly and becomes very offensive. The phosphatic base may be mixed with lime, ammonia or ammonia and magnesia. The form is usually oblong, the structure may be laminated or not, according to the predominance of lime in the composition of the stone, and they are always rather soft in texture, breaking down easily under pressure.

FIG. 106.



Nucleus surrounded by Oxalate of Lime; and this covered by layers of Urate of Ammonia.

FIG. 107.



Mulberry Calculus.

All these varieties of calculi may be intermixed with each other, a large gravel being often composed of the different materials intermixed. Besides the above, authors have recognized a great many other varieties of calculi; but as the subdivision of their chemical constituents is at present rather a matter of curious investigation than of practical import, their further consideration in this volume may be safely omitted.

When calculi form in the kidney, they are usually large in size, provoking a heavy feeling in the loins, with pain, frequent straining efforts at micturation and occasionally sanious urine. When they leave the kidney and pass along the ureter to the bladder, they excite intense pain through the loins, the suffering extending down the spermatic cord to the testes and even along the thighs. The bowels are constipated, the patient is disposed to vomit, the testicle is retracted, febrile action is excited, the urine is voided frequently, but in small quantities, and may be bloody or muco-purulent. The symptoms are marked and unmistakable till the stone reaches the bladder. All calculi, however, are not developed in the kidneys, the majority of them appearing to have their nucleus of development in the bladder itself. Their presence here usually gives rise to constant uneasiness and pain, with difficulty during micturation. The patient has a desire to void water frequently and a full stream may be suddenly interrupted during its passage, beginning again as the patient changes his position, the head of the penis always suffering during the act and a few drops dribbling away after the bladder appears to be emptied. The urine is not unfrequently bloody and is sometimes muco-purulent; the patient's appetite fails, he is disposed to stoop forward and rest himself upon his hands and knees, and the system soon becomes emaciated. Constant irritation of the bladder, with congestion about the points where the stone lodges, may excoriate the surface of the cyst and lead to extensive superficial ulceration. Upon the occurrence of the above symptoms, the surgeon is always warranted in supposing that the patient is troubled with stone; but as these signs may be simulated by other affections, there are no means of positively knowing the fact till the bladder has been sounded. Sounding is a trying operation and should not be undertaken till there is good reason to believe that stone exists and that its size is sufficient to demand removal by lithotomy. In making this examination of the cyst, the system of the patient is to be relaxed and soothed by the free use of lobelia pills for several days. When all undue excitement has been thus quieted, a curved sound is to be well oiled and gradually introduced through the urethra, the patient lying upon his back and the bladder being distended either by retained urine or by the injection of a pint or more of tepid water. After the sound has entered the bladder, it should be moved about cautiously, the presence of stone being known by a clicking sound that will be felt along the handle of the instrument. This sound is unmistakable, but may be simulated by the instrument striking against the tightened walls of the abdomen, or against a fibrous tumor within the cyst. The exercise of proper discretion, however, will enable the surgeon to distinguish between these difficulties. It must be remembered, on the other hand, that a stone may be imbedded in the mucous folds of the bladder and the sound strike against the cyst without actually reaching the calculus. Under such circumstances, the examination should be made with due care and may be repeated at intervals of ten or twelve days, in order to still further satisfy the surgeon as to the true nature of the difficulty. When a calculus is encysted, it does not provoke as much difficulty as when it lies loosely in the bladder, and hence becomes a much less formidable difficulty.

TREATMENT.—The surgeon has little to do with the calculous diathesis, his services being generally demanded after the gravel has formed. Even then, however, it is often possible to relieve many of the sufferings of the patient by medication alone, and a judicious course of management is not only likely to stay the further enlargement of the stone, but may secure its disintegration and ultimately wash it way. In all cases, the skin must be freely opened by regular tepid sponges and occasional vapor baths, followed by friction; the digestive apparatus is to be protected by limiting the diet and sustained by tonics; eupatorium purpureum may be used when the urine is red or muddy, and arctium seeds with mentha when it is pale and copious; nervous prostration must be aided by small drinks of zinziber, asarum or cypripedium; and systemic excitement is to be quieted by compound pills of boneset, asarum and lobelia. The suffering in the loins may be eased by tepid sitz baths. It has been recommended to administer alkalies in cases of lithic acid gravel, and this treatment has many admirers; but it is objectionable from the facts that, *first*, the alkali may be converted into a phosphatic compound and increase the size of the stone rapidly; and, *second*, a system of sanative medication does not recognize the propriety of attempting to overcome disease by chemical formulas. The surgeon must place his dependence upon those means (as above pointed out) that have power to restore the deranged functions without overturning any of the vital operations of the system. Judicious care of this kind is frequently crowned with success, which is more than can be said of any of the chemical systems of cure ever advanced.

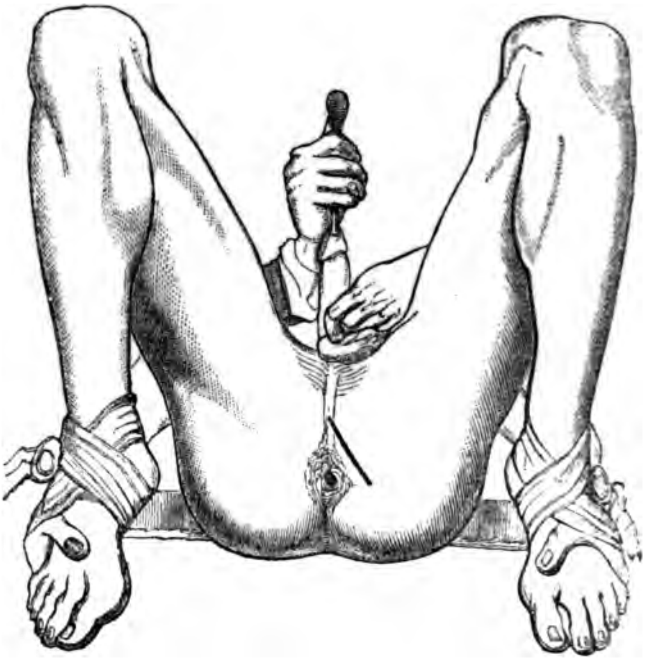
When calculi are small, and even when they are of considerable sizes, it not unfrequently happens that they will be spontaneously passed away. This result may often be brought about by keeping the system pretty well under the influence of lobelia, at the same time giving arctium or eupatorium purpureum, according to the nature of the case. Nature, when thus aided, is disposed to make vigorous efforts to expel the offending material. If the calculus becomes lodged in the urethra, the patient must be at once relaxed by the constant use of broken doses of lobelia. The urinary passage will then give way before the stone instead of contracting upon it, and the gravel may be successfully ejected without any further surgical interference. Dr. Ewart, of Greenup, Illinois, has recently written to us of a case in which a man under his care voided a calculus half an inch in diameter one way and one-fourth of an inch the other; and Dr. Kline, of Bowman's Mills, Virginia, has reported a case (see Physio-Medical Recorder, vol. xxi, p. 26) in which a lady under his care passed a stone weighing seven ounces two drachms and a half and measuring nine inches by its largest circumference and seven by its smallest.

It must be understood, however, that, although the above course of management will do much toward reducing the size of calculi and favoring their passage, by far the greater number of these cases (when occurring in adults) do not yield in the least to such treatment. The gravel continues to increase gradually, the sufferings of the patient become more intense and no special relief can be afforded except by surgical interference. The stone must be extracted, either by lithotomy or lithotrity. The former procedure is altogether the more successful, as well as the safer of the two, hence we will proceed at once to its consideration.

Lithotomy.

Before undertaking lithotomy, the surgeon must first satisfy himself of the existence of stone, as also of its probable size and usual position, by the judicious use of the sound. There must not be any deception in this matter; and this formidable operation is not to be determined upon merely because the presence of a calculus is *suspected*, or because the sound strikes an unknown *something* in the bladder. No procedure can be more rash, none is more unjustifiable or more likely to prove fatal. Having satisfied himself of the existence of a gravel, the surgeon's next duty is to put the patient's system in the best possible state of health, and to quiet all nervous excitement, by the use of the measures that were mentioned in the last section. On the morning of the operation, the bowels of the patient should be unloaded by an enema and the perineum shaved. When preparing to operate, the surgeon should first ascertain whether or not the urine has been voided within the past three or four hours and, if it has, the bladder should be about half filled by injecting tepid water. The patient is then laid upon a strong table, his buttocks close against one edge of it, his knees strongly flexed, his shoulders raised and a foot grasped by each hand, in which position his limbs are to be bandaged. Anesthesia having been induced, a full sized grooved staff is to be introduced to the bladder and its point brought in contact with the stone. One assistant is directed to hold this staff firmly against the symphysis pubes; another assistant is detailed to each limb to hold it outward and steady it, while a fourth is stationed to wait upon the

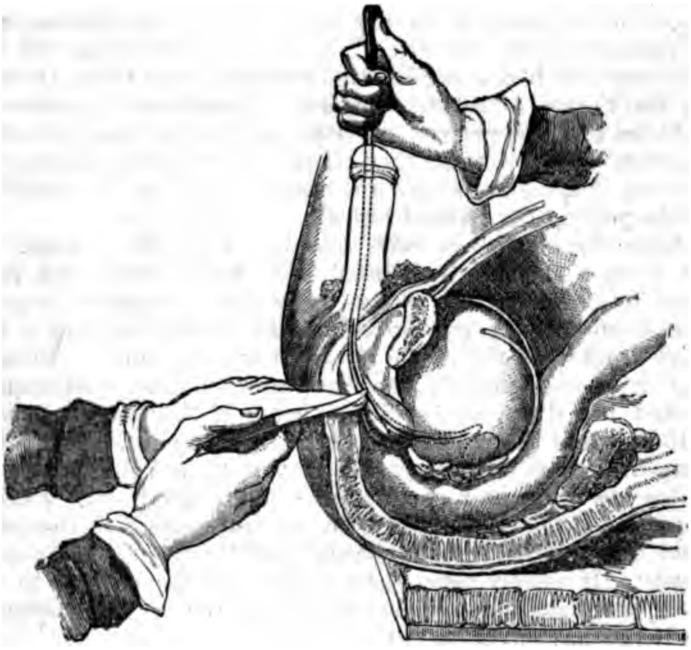
FIG. 108.



Position of the patient in operating for Lithotomy, the dark line on the perineum showing the direction of the first incision.

surgeon and hand him the various instruments as he calls for them. The surgeon then seats himself in front of the patient, between his legs, ascertains the size of the prostate gland by examination per rectum and then proceeds to make the first incision. This should be made with a firm scalpel, commence in the raphe about an inch and a half above the anus, be carried downward and outward to the surgeon's right till it reaches a point on a level with the anus and two-thirds of the distance between the bowel and the tuberosity of the ischium and extend about one inch in depth. The forefinger of the surgeon's left hand is then introduced to this wound and the dissection carried forward till the staff is reached. Having clearly defined the groove in the staff, the surgeon is to push the point of his scalpel through the tissues of the urethra (behind the bulb) and insert it into the groove as a director. The blade of the instrument being then fixed so as to look a little outward (to the surgeon's right), it is to be carried steadily forward, severing the perineal fascia, the levator ani and the prostate. If care has been taken not to

Fig. 109.



Continuation of the dissection in Lithotomy. Knife entering the urethra, the line showing the direction in which it is pushed along the groove and through the prostate.

let the knife slip from the groove usually entered without doing a adjacent parts. The knife may same course that it entered and att the stone.

The stone may be extracted by prostate by the forefinger (not all too freely) and then passing a p (previously warmed) along the fi The finger alone is sometimes s and effect its removal; but when and the gravel has been found finger of the surgeon having bee be made upon the calculus. No solid must be drawn steadily and c for the tissues to spread before i have the calculus present its shor is necessary to ascertain that ther nor any fragments of the one re before putting the patient to bed.

After the stone has been rem put upon a suitable bed, dosed fr clean by changing the sheets un elastic tube being introduced to wound and worn thus for forty-eig cent drinks should be given freel diluted hot drops or capsicum, fluttering and the patient seems d escapes through the wound for a or less swelling and excitement exudations are gradually thrown flows through its natural channel pletely. It usually takes three w cover, and aged persons, and those diathesis, may suffer longer.

The danger in lithotomy is at decidedly one of the capital op patient may die under the shock hemorrhage may prove fatal, the into the cellular tissue and lead to monous erysipelas may be prov alarming degree may follow upon in those cases where the positio make it difficult of extraction. are most likely to result in aged surgeon is seldom justified in atte ation in persons over sixty years old. When any of the above unpleasant complications follow upon the operation, the new danger is to be met by those means and measures that have been already advised in different sections and chapters of this volume, the treatment for sinking being found under the head of *Shock of Injury*, and that for sloughing being treated of in the chapter on *Gangrene*. It is in view of these serious contingencies, that such earnest advice was given (in the first part of this section) to prepare the patient well before undertaking the operation; for without such preparation, death can scarcely be averted, while with it, life may be saved even when extravasation of urine is great or suppuration or gangrene considerable.

During the operation itself, several accidents may occur. *First*, The pudic artery may be severed by having the blade of the knife stand too far outward and by carrying the incisions too far backward. The artery is to be immediately ligated. The surgeon may let his knife slip out of the groove in the staff and wound the larger blood vessels or incise the bladder beyond the prostate and jeopardize life by making a way for the urine to escape unchecked among the cellular structures. It is far better to wound the bulb of the urethra than to endanger the bladder by beginning the puncturing incision too far back. By carrying the knife too nearly in the mesial line, the bowel may be wounded and a grave recto-vesical fistula formed. These accidents can usually be averted by due care and a proper acquaintance with the anatomical relations of the parts.

Thus far we have spoken of but one mode of practicing lithotomy. This, the *lateral* operation, is the best one and the one most commonly practiced; yet other methods of procedure have been tried. *First*, There is the *high* operation, in which the bladder is reached by shaving the pubes and making an incision through the linea alba at a point where the peritoneal folds are not interposed. When the stone is of very great size or the prostate is much enlarged, this operation may be practiced. *Second*, The *recto-vesical* operation, in which the incision is made through the rectum, reaching the bladder behind the prostate. It is an unscientific procedure and should not be practiced.

Lithotrity

The operation of lithotrity was long a favorite with some of the French and German surgeons, and is still practiced by some operators in both Europe and America. It is a less

PART V.

THE OPERATIONS OF SURGERY.

CHAPTER I.

SIMPLER OPERATIONS.

Administration of Chloroform.

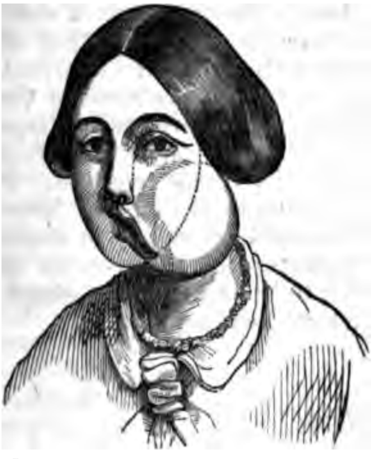
SINCE the introduction of chloroform to surgical practice, but few operations are performed without its use. The danger connected with the administration of the article, however, should be at all times borne in view; for it is evident that the agent is poisonous and powerfully penetrating, and nothing but the nice adjustment of the quantity of the anesthetic to the vital capacity of the patient can render its administration at all safe. By due caution, it is seldom that serious accidents will result from its use. It may be administered as follows: The patient having been placed in position, the chloroform is to be poured upon a folded silk handkerchief, or a hollow piece of sponge covered over with a napkin. The handkerchief or napkin is then brought gradually toward the nose of the patient, being held at a distance of about three inches from it till the effects of the anesthetic begin to manifest themselves a little. The chloroform is then to be brought nearer to the nose, but should at no time be held at a less distance than an inch from it. By this mode of procedure, the patient will not be influenced too suddenly and atmospheric air will at all times have free ingress to the lungs in connection with the chloroform. The too sudden administration of the article, or the exclusion of atmospheric air, invariably produces serious results.

As a general thing, pure chloroform should be used, though some surgeons are partial to an admixture of chloroform with sulphuric ether. The administration of the article should be continued till the muscles of the patient are relaxed. The patient is at first talkative, excitable and throws himself about violently, but becomes perfectly quiet when anesthesia has been produced to a sufficient degree. A finger should be at all times placed upon an artery in some convenient position, and the state of the pulse carefully noted. If the vessel is paralleled restorative virtues of the Physio-Medical agents give this system of treatment a control over the frame unknown to any other mode of practice.

Extirpation of Tumors.

Among the simpler surgical operations is that of the extirpation of tumors, and a discussion of this section will serve to give a proper idea of the general mode of making incisions. It is impossible to give explicit rules that will apply to all classes of cases; and the surgeon must always use his own judgment in considering the anatomical relations of the parts in which the tumor grows, and proceed accordingly. When the tumor is situated upon an even surface, is distinctly circumscribed and not of a large size, one simple incision may be made through the integuments in a direction with the largest diameter of the growth, providing that diameter is parallel with the course of the blood vessels in the parts. The scalpel being held between the thumb and fingers, after the manner of holding a pen in writing, the point of the blade is inserted through the integuments and cellular tissue, at right-angles with the surface, the skin being at the same time gently stretched by the fingers of the surgeon's other hand. The handle of the knife is then to be inclined downward and the integuments severed by one sweep to that extent which the size of the tumor demands. A plain incision is seldom required to be as long as the full length of the tumor, though it may be well to extend it a little beyond the growth at both ends. Two flaps are thus made, each of which is to be carefully dissected up from the surface of the growth, every portion of the tumor being exposed to view. One edge of the base of the tumor is then to be lifted up by the fingers, by a tenaculum or by forceps, and the dissection proceeded with. In nearly all instances, the chief vessels of the part lie under the base of the tumor, and the knife will need to be used with the

FIG. 110.



Plan of straight incision for removing a simple tumor of the Jaw.

utmost caution lest undue injury should be done to th
The whole tumor should be removed, the severed vessels b
ligated immediately upon being cut. The open cavity is t
to be irrigated with water, the edges of the wound brou
together with adhesive plasters or sutures and the parts t
left to heal.

When a tumor is of very large size, and of an elonga
form, two elliptical incisions are preferred. This beco
advisable mainly because it is necessary to remove a por
of the integuments lest an inconvenient redundancy of f
should be left over the part after the growth is removed.
superficial incisions having been made through the skin
cellular tissue, the flaps are to be dissected back and the
mor methodically dissected out at its base, as in the case
simple incision. An example of this mode of procedure
been already given in the case of extirpation of the bre
Figure 101. In malignant growths, the elliptical incision
generally preferred, as it is then necessary to remove
superficial integuments in order to escape all the degenera
material. A triangular form of incision is, however, so
times adopted in these cases; but the surgeon is at great
erty in selecting his mode of procedure, the great object to
kept in view being to incise the tissues freely and at a su
cient distance from the tumor to warrant the belief that
the malignant deposits are included within the parts remov
There are cases in which a crucial incision is preferred to t
straight. This plan is more particularly followed when lar
tumors under the scalp are being dealt with, each of the fo
flaps being then dissected back and the tumor removed.
should never be employed where a simple or elliptical inc
ion will answer the purpose. V-shaped incisions are som
times used, not so particularly, however, for the removal
tumors. In all cases, the wound is to be treated as a simp
wound after the morbid growths have been removed.

Bandaging.

The majority of bandages may be formed of unbleach
muslin of medium stoutness and free from starch. T
material is usually cut into strips, varying from half an in
to three inches in width, and then rolled up into a kind
spool and kept ready for use. Such bandages are most app
cable to the extremities. Handkerchiefs or broad musl
bands are also used as bandages, especially when poultic
are to be kept in place or a member supported in an ea

position. Many very peculiar and complicated applications of this kind have been devised, but the simpler apparatus is at all times preferable. The snug adjustment of a bandage requires considerable practice; and written directions are of but meager importance, serving no further purpose than to point out a few general rules of procedure. The young surgeon should endeavor to become expert in this line, by practicing freely upon himself or his friends; for he will find that the snug appliance of a bandage will often do his patient much service and bring him more credit than the performance of some heavy operation.

Bandage for the Head.—The head may be bandaged by applying the body of a four-tailed bandage over the desired part, then bringing the two posterior tails forward and tying them under the chin and carrying the anterior tails backward and tying them under the occiput. A very efficient and popular mode of applying retentive apparatus to this part consists in arranging a handkerchief in a triangular form, placing the center on the forehead, crossing the ends behind and then bringing them forward and tying them. The apex of the triangle is next smoothed over the head, passed under the crossed ends, brought up behind and secured. The application of the four-tailed bandage to the jaw has been already noticed at page 358.

Bandage for the Axilla.—Dressings may be retained in the axilla by passing a broad piece of muslin under the arm, crossing its ends over the shoulder, carrying one end down behind and the other in front and tying them under the axilla of the opposite side.

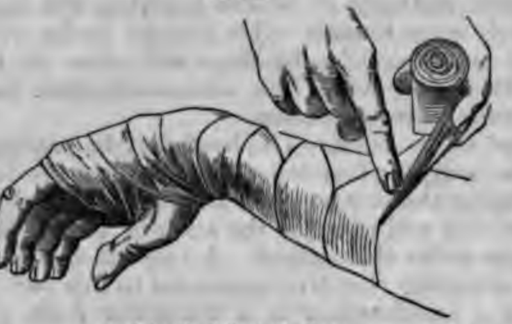
Bandage for the Breast.—The breasts may be conveniently sustained, or a poultice maintained upon them, by fitting a muslin yoke upon the neck, attaching the base of a triangular bandage in front of this, passing it over one breast and under the axilla of that side and then fastening its apex at any suitable point on the back part of the yoke.

Bandage for the Hand.—A roller bandage, about two inches wide, is generally applied to the hand in the form of a figure 8. The free end of the roller is to be placed upon the wrist, carried over the edge of the hand behind the metacarpal bone of the thumb, continued across the palm, brought up across the metacarpal bone of the little finger, carried over the dorsum and down again upon the palm, leaving the thumb free, and brought up across the wrist, where a few turns of the roller may be taken and the whole secured by pins or stitches.

Bandage for the Forearm.—When the forearm is to be band-

aged, the roller is first to be secured to the hand, in the
ner just described, and then carried up the member by re
turns. When the swell of the arm is reached, the upper
of the roller is to be lapped over and then another turn
and the lap repeated, as is illustrated in the cut. B

FIG. 111.



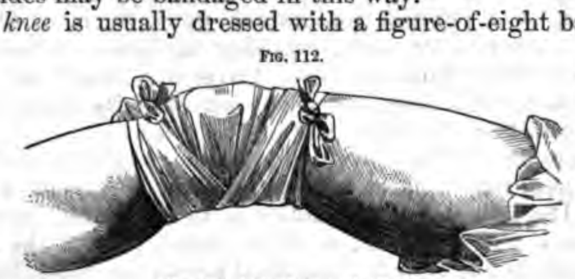
Applying the Roller to the Forearm.

simple procedure, the bandage is made to fit snugly and
turn should be drawn tight enough to secure its position
the arm, but not to interfere with the capillary circulati

Bandage for the Groin.—First pass a girth around the
and secure it above the crests of the ilii. To the fro
this attach a long triangular piece of muslin, the base re
upon the girth and the apex being carried down acros
iliac region, under the thigh and up again over the troch
to the front part of the girth, to which it is to be secur
that point which will cause it to fit most snugly in the
Both sides may be bandaged in this way.

The *knee* is usually dressed with a figure-of-eight ban

FIG. 112.



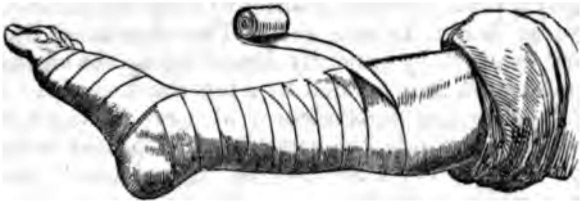
Four-tailed Bandage on the Knee.

Bandage for the Foot.—A three-inch roller is generally
for the foot. Its free extremity is laid upon the metat
of the great toe, carried inward over this toe, up ove
dorsum of the foot, around the ankle, back over the do
down and under at the metatarsus of the little toe and

across the great toe again. At each successive turn of the roller over the inner edge of the foot, it is carried about two inches toward the tarsus, so that about five turns will reach the instep. The bandage is then to be passed twice around the ankle and fastened.

Bandage for the Leg.—The foot is first to be bandaged, as above, and the roller then carried gradually up the limb, being turned sharply upon itself when the calf is reached. This bandage may be continued to the groin and then passed twice around the body, above the crests of the ilii, and secured.

FIG. 113.



Bandaging the Leg.

CHAPTER II.

DELIGATION OF ARTERIES.

THE arteries of any part of the body may need to be ligated in their course, either for the arrest of hemorrhage, the relief of an aneurism or to save the loss of blood preparatory to amputation. The artery is reached by direct incision and dissection between or through the muscles, when its sheath is opened, a ligature of suitable size passed under it with a curved needle and one end brought out upon each side of the vessel and tied. The nerves and veins should be at all times freed from the artery and the knot should be firm and the ligature drawn sufficiently tight to sever the inner coats of the vessels, as has been already mentioned in the chapter on *Hemorrhage.* One end of the ligature is then cut off close to the knot and the other left pendent from the wound, the whole being removed at such time as the nature of particular cases demands, being left to slough away when practiced for aneurism and the arrest of hemorrhage, and occasionally removed after the performance of amputation when the deligation has been practiced preparatory to this procedure.

Deligation of the Common Carotid.—This artery is generally tied near the angle formed by the anterior edge of the sterno-mastoid and omo-hyoid muscles. The patient is to be placed upon his back, the shoulders elevated and the head allowed to fall down a little. The artery is then reached by making an external incision, nearly three inches long, parallel with the anterior edge of the sterno-mastoid muscle. The superficial cellular tissue and fascia having been dissected, the head is to be brought a little forward in order to relax the muscle, which is then to be drawn to one side. The sheath of the vessel being now exposed, by carefully dissecting up the strong fascia of the omo-hyoid, it is opened by a few touches of the scalpel. The jugular vein and descendens noni nerve having been carefully pushed to one side, the vessel is to be ligated in the usual manner. This artery may also be ligated above the omo-hyoid by making an incision in such a manner that its upper edge shall terminate on a level with the cricoid cartilage. The several layers of fascia are then dissected up carefully, the sheath of the vessel opened and the ligature passed. There is more likelihood here of coming in contact with the veins, and the former site of operation is the preferable one.

Deligation of the Innominata.—In seeking to ligate the innominata, the patient is placed in the same position as for ligation of the common carotid. One incision is then to be made along the outer edge of the sterno-mastoid muscle, terminating at the clavicle, where it is met by a rectangular incision extending parallel with this bone. The flap thus formed is to be turned back and the clavicular origin of the mastoid cut away. The severance of the muscle must be performed upon a director passed behind it in order to avoid wounding the vessels underneath. The sterno-hyoid and sterno-thyroid are next to be divided in the same way, after which the fascia is pinched up and carefully severed. The carotid is thus brought to view, when it may be traced downward to its origin upon the innominata, the vein pushed to one side and the ligature carried around the artery close to its bifurcation. This operation is an extremely dangerous one and is very seldom practiced, ligation of the subclavian being altogether the preferable procedure when such an operation is demanded for aneurism or for any other cause.

Deligation of the Subclavian.—Either of the subclavian arteries may be tied at a point external to the scalenus muscle, or the right subclavian may be ligated between the scaleni near the region of the innominata. The vessel is reached by laying the patient upon his back, turning the head to one side and making a direct incision above the clavicle and parallel to it. The platysma and the skin should be cut through at the first stroke, after which the dissections are to be carried on past the margin of the sterno-mastoid down through the fascia to the outer edge of the scalenus. The scalenus is then used as a guide to the surgeon in passing his finger down to the rib, at the angle between which and the muscle the subclavian will be found, and at this point it may be ligatured. This operation is also an extremely formidable one, but may be safely performed previous to amputation at the shoulder joint. It is not likely to prove beneficial in cases of aneurisms seated upon this artery beyond the scaleni muscles.

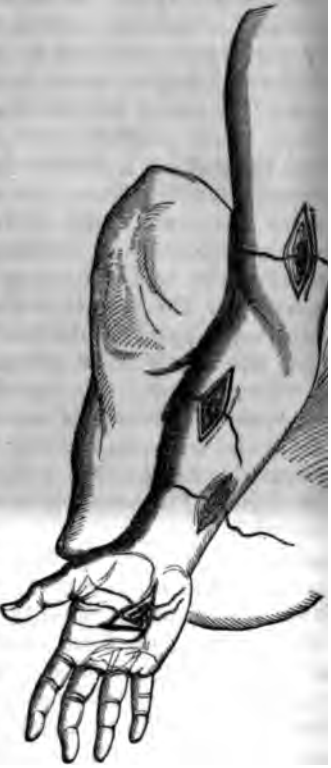
Deligation of the Axillary Artery.—The axillary artery may be reached by making a convex incision below the border of the clavicle (extending from the sternal end of this bone to the interior margin of the deltoid), carrying the incision through the pectoral and dividing the loose cellular tissue. The cephalic vein and thoracica cromialis artery are to be carefully avoided, the vein then brought into view by turning the flap downward and carefully scratching through the fascia, after which the vein is to be pressed downward and the artery exposed, when it may be ligatured. A more simple mode of operating upon this artery, however, is by lifting the arm outwardly from the body, supinating the forearm and making an incision over the head of the humerus near the margin of the latissimus dorsi. The vessel is thus exposed at once and may be ligated with ease.

Deligation of the Brachial Artery.—This artery may be exposed by making an incision along the inner border of the coraco-brachialis muscle, the edge of the knife being directed toward the center of the limb and the internal cutaneous nerve and basilic vein being avoided. The external cutaneous and median nerves lie upon the outside of this artery at the middle of the arm, and the brachial veins lie in close approximation upon either side. These parts should be drawn to the sides by blunt hooks in order to expose the artery more fully. The vessel is then to be examined to see that it does not bifurcate a little above the incision. If there is a division, the ligature must be applied upon its cardiac aspect.

When this vessel is to be ligated lower down in the arm, the inner border of the biceps muscle is to be the surgeon's guide in making the incision. This point is to be carefully remembered, as the inferior profunda artery may be mistaken for the brachial if the cut is made too low down. The biceps may require to be raised a little before the vessels can be reached, and the median nerve lies superficial to the artery in this position. There may also be a bifurcation of the humeral near or above this point, and this must be examin before the operation is completed.

Deligation of the Radial Artery.—This artery may be its upper third by incising the parts along the inner of the supinator longus. A director is then slipped the superficial fascia and brachial aponeurosis and these tissues divided. The supinator longus and pronator teres being then drawn aside, the vessels will be exposed. The veins and radial nerve are then to be pushed away, the sheath of the artery opened and the vessel ligated. The same mode of procedure is followed when this vessel is to be operated upon at the middle of the arm.

FIG. 114.



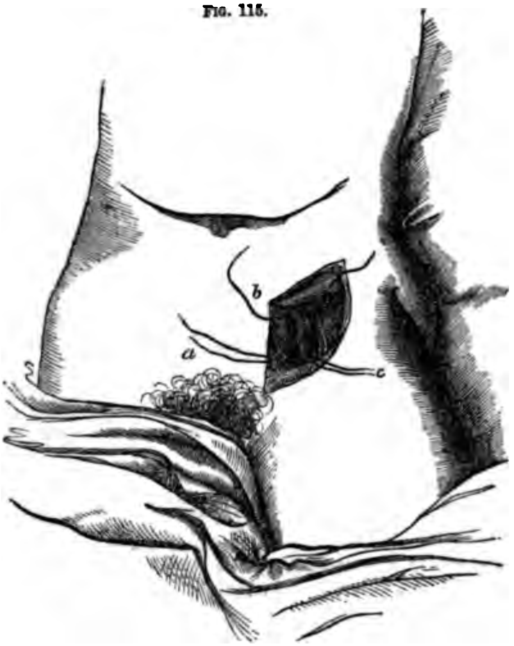
Deligation of the Brachial, Radial and ries; also of the Palmar Vessels.

Deligation of the Ulnar Artery.—The ulnar artery may be tied at its upper third by firmly supinating the hand and then carrying an incision from a point two inches below the middle of the elbow downward about three inches to the edge of the ulna. The aponeurosis having been divided, the flexor sublimis and flexor carpi ulnaris are to be separated with the fingers. The hand is then to be bent, the flexor sublimis drawn outward, the lifted up with a director and the ligature passed un This vessel is more commonly operated upon at its third, where it is readily reached by a direct superficia ion and careful separation of the fascia and aponeuros

The branches forming the palmar arch can be reac laying open the tissues, drawing the tendons to one si applying a ligature to as many of the vessels as may s require it.

Deligation of the Iliacs.—Make an incision throu abdomen, from the upper edge of the abdominal ring, nearly parallel with Poupart's ligament, within an inch of the anterior superior spinous process and extending about two inches above it; dissect through the muscular layers carefully; pinch up the transversalis fibers and sever them; incise the aponeurosis upon a director and then push back the spermatic cord with the finger. The peritoneum having been separated from the fascia and pushed aside, the psoas muscle is to be traced till the pulsating vessels are reached. By this mode of procedure, the common, internal and external iliacs may be brought to view, and either one ligated, according to the necessities of different cases.

FIG. 115.

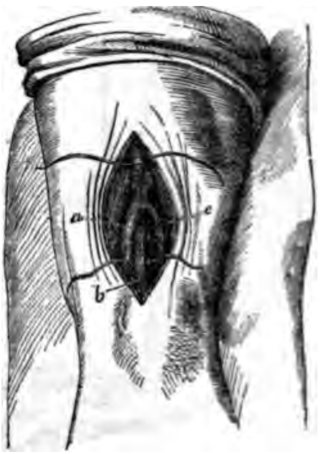


Deligation of the Iliacs: *a*, the Internal Iliac; *b*, the Common Iliac; *c*, the External Iliac.

Deligation of the Femoral Artery.—This artery is best tied just above the angle formed with it by the sartorius. A straight incision is to be made along the anterior surface of the thigh, the fascia lata divided, the tissues held to one side by hooks and the vessel raised upon the director and ligated.

Deligation of the Popliteal Artery.—The popliteal artery may be tied at any point in its course, but the operation is usually performed at the upper angle of the popliteal space or else at a point between the heads of the gastrocnemius. In the operation at its upper part, an incision is made through the skin and fascia along the outer border of the tendons of the semimembranosus muscle. The artery may be felt lying against this part. The saphena vein is to be drawn to one side and the deep-seated fascia divided upon a director. At this point in the operation, the muscles may be relaxed by flexing the limb a little and the other parts drawn to one side by blunt hooks. The popliteal nerves and saphena vein are to be avoided and the artery will be exposed deeply seated behind the curve of the saphena. When the operation is performed at a lower point upon the artery, an incision is made from the point where the tendon of the sartorius and gracilis clasp the tibia, from which it is carried down to the distance of about three inches and obliquely backward. The saphena vein and nerve lie near the skin and are to be drawn to one side. The head of the gastrocnemius being now made out, is to be drawn outward by a hook, when the artery with its attendant veins will be found lying about an inch below this muscle. Neither of these operations is very advisable, and it is usually preferable to ligature the femoral.

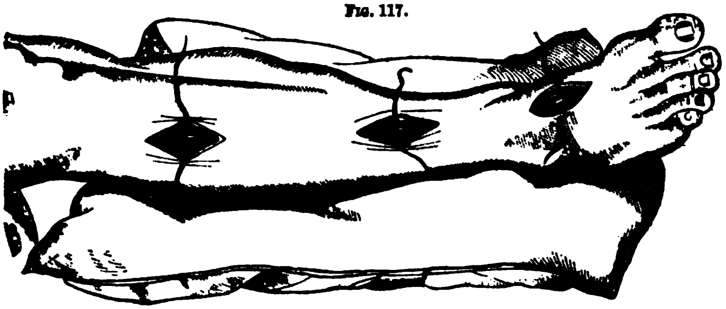
FIG. 116.



Deligation of the Popliteal. *a.* The Popliteal Vein. *b.* The Artery. *c.* The posterior Saphena Vein. The sciatic nerve should have been represented to the outside of the artery.

Deligation of the Anterior Tibial Artery.—The anterior tibial may be tied at its upper third, by placing the patient upon his back and then endeavoring to trace the course of the artery along the external margin of the tibialis anticus muscle. An incision three inches long is to be made in the course of this muscle, the fascia and aponeurosis slit by passing a director under them and the cellular groove made out. The space between the tibialis anticus and extensor pollicis pedis is then to be opened, when the muscles may be relaxed by flexing the foot and the vessel exposed at the bottom of this opening. The nerves being drawn to one side, as before, the artery is to be isolated and raised on a director, when the ligature may be passed under it and the operation completed. When this artery is to be tied near the dorsum of the foot, an incision two inches long is to be made directly over the course of the vessel, the lower end of the incision terminating at the angle of the interosseous space. The fasciæ are to be divided, the tendons of the extensor brevis drawn aside and the inter-tendonous fascia then severed, when the vessel will be at once brought to view. The director may be passed under it from within outward and the ligature then applied.

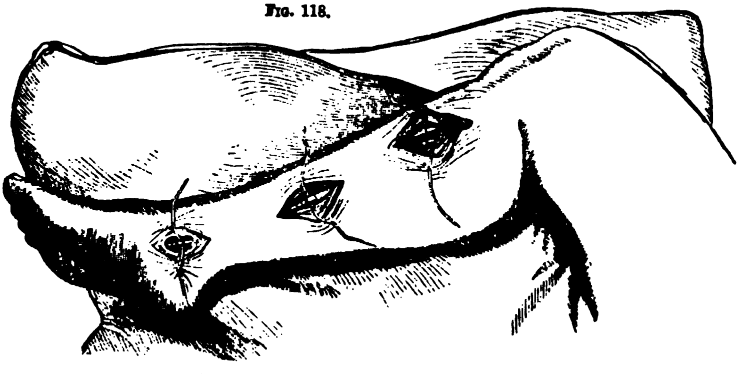
FIG. 117.



Deligation of the Anterior Tibial at three points.

Deligation of the posterior Tibial Artery.—This artery is usually operated upon in its upper third. The limb is to be laid upon its outer side and the knee gently bent; an incision about four inches long is then to be made behind the inner edge of the tibia and parallel with this bone. The fascia and aponeurosis having been divided, the saphena vein is to be drawn to one side and the gastrocnemius muscle exposed. This muscle is then turned back with the hooks, when the soleus may be divided by passing a director under it and making a few longitudinal incisions. The surgeon next meets with the strong fascia of this part of the limb, which is also to be divided upon the director. The vessels are now brought to view, when the artery may be isolated and a ligature passed

FIG. 118.



Deligation of the Posterior Tibial at three points.

under it. This is a very tedious operation and one that should not be performed when it can be avoided. The vessel is more conveniently ligated at its lower third. It may be reached by an incision parallel to the tendo-achillis and upon the inner side of this tendon, where the skin and a few fascia only will need to be divided. The venæ comites are to be separated from the artery, the vessel lifted up upon a director and ligated in the ordinary way. This artery may also be reached behind the internal malleolus, by making an incision two inches long about midway between the tendo-achillis and the inner ankle. Some surgeons prefer to make this incision semi-circular. The superficial aponeurosis is then to be divided upon the director, when the vessels will be exposed.

Deligation of the Peroneal Artery.—This artery may be operated on in its upper third, or in its lower third, very much in the same manner as the posterior tibial is reached. The leg being partially flexed, the patient is placed upon his face and an incision made a little external to that for the tibial artery in each case.

CHAPTER III.

AMPUTATIONS.

General Remarks.

The circumstances under which amputation of a limb may be required, have already been spoken of in different parts of this volume. These operations are to be avoided as long as possible, but must be performed promptly and determinedly when it becomes evident that the sanative virtues of Physio-Medical measures are no longer capable of saving the part from disorganization. In chronic forms of disease, the operation may be performed after mature deliberation on the part of the surgeon; but in cases of compound and comminuted fractures, or other serious injuries—threatening life by mortification—amputation must always be performed upon the spot and, when possible, before the patient recovers from the shock of the first injury.

The first point in these procedures, is to arrange all the instruments handily, and next to avert excessive hemorrhage by applying the tourniquet on the blood vessel above the part where the incisions are to be made. The patient having been laid upon the table and brought under the influence of chloroform, the surgeon is to take his position at his right side and the tourniquet is then to be tightened. Two modes of making flaps have been followed. The first and oldest one, is that known as the *circular* method. In performing it, the superficial tissues are incised by a circular incision and then gently retracted by the hands of an assistant. Another circular incision is then made through the outer layer of muscles and close up to the point of retraction of the superficial integuments. Retraction is then again made upon these parts and a third circular sweep carried down to the bone. This mode of procedure may be employed when one part of the bone is superficial, as in the tibia; but it causes the loss of more flesh than the flap operation, does not always form as convenient a stump and requires longer time in its performance. In the second, or *flap* mode of making incisions, the soft structures upon one part of the limb are raised upward by the left hand of the surgeon and then transfixed with the knife, the blade of which is drawn outward and downward at that angle which different parts demand. The integuments of the other side of the limb are then drawn gently down and the knife passed under the bone and carried outward and downward, forming a flap corresponding to that already formed upon the upper part of the bone. This mode of procedure allows the amputation to be performed quickly, saves a great deal of integument and favors the formation of a good stump. In very thick parts, one of the flaps may be made by transfixing the skin, as in the second mode of procedure, and then dividing the muscular structures with a semi-circular sweep of the knife. This averts the possibility of including an unwieldy mass of muscle in the stump. Flaps are sometimes formed by incising the structures from without inward. This mode of operating is best suited to superficial bones, as the anterior edge of the tibia.

After the flaps have been formed, the parts are to be held back by the hands of an assistant, when the periosteum and other parts adherent to the bones are to be severed with the scalpel. The heel of the saw is then applied to the bone and the thumb of the surgeon brought against its blade—the lower part of the extremity being steadied by the surgeon's left hand, as well as by the aid of an assistant. A groove in the bone is then made by drawing the saw steadily from heel to point, after which the amputation may be completed by carrying the saw slowly and with a sweeping motion till the bone is severed. The limb should not be elevated so as to lock the saw, nor depressed so as to form spiculæ by breaking off the lower parts of the bone. The bone should always be removed as high up as the incisions through the soft parts

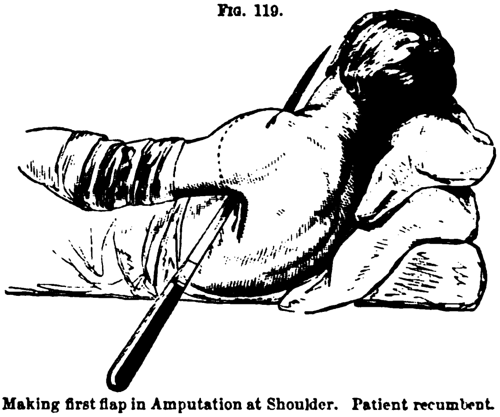
will admit, all spiculæ are to be nipped off by the pliers and the sharp edge of the bony stump may be rounded off by being rubbed with the handle of a cartilage knife.

The larger arteries are now to be secured by ligature after the manner that has been already directed at page 291. The tourniquet is then to be gradually loosened and the smaller arteries secured as their presence is made known by the scarlet jets that will be cast from them. It is not necessary to be tedious in securing the smaller blood vessels, as many of them will soon be occluded by coagula when the flaps of the stump are brought together. The tourniquet should be entirely removed as soon as the larger arteries are ligated, and the flaps may be then closed and a few sutures taken through the tissues in order to bring the lips of the wound together. Long strips of adhesive plaster may be then fastened over the surface and the whole carefully but lightly dressed with a cotton roller. An opening should be left at the most pendent part of the roller, in order to allow the free escape of the discharge. Some surgeons lay a pledget of cotton against the stump and under the bandages, in order to absorb the oozings from the wound; but this is not necessary in all cases. The patient is then to be put quietly to bed and managed as in any other case of severe wound (see chapter iii, Part III).

Amputations of the Upper Extremities.

Amputation at the Shoulder Joint.—The patient may be seated in a chair, or placed upon his side with the shoulders well elevated. The tourniquet can not be applied, therefore hemorrhage is to be restrained by compressing the subclavian with the fingers of an assistant pressed firmly down above the clavicle; or this artery may be ligated near its acromial extremity before the incisions are made. The first flap is then formed on the right shoulder by entering the knife an inch below the acromion and passing it downward

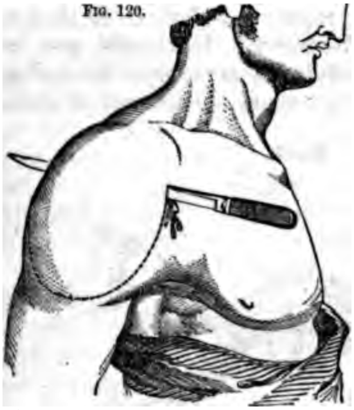
FIG. 119.



Making first flap in Amputation at Shoulder. Patient recumbent.

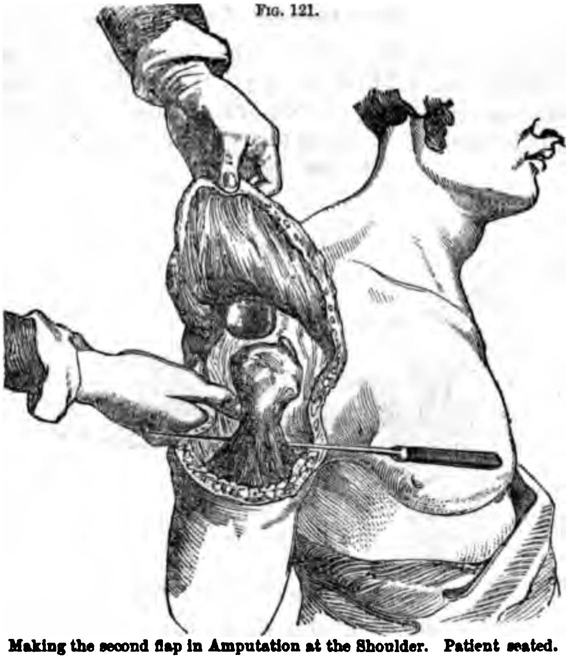
and bringing it out just within the posterior border of the axilla. The knife is then brought out with one sweep along the posterior portion of the humerus, thus forming the flap by the severence of the deltoid muscle. The capsule of the joint is now cut across, an assistant carries the arm across the chest, or holds it against the side, and disarticulation of the bone is effected. The knife is then passed behind the head of the humerus and carried inward and downward in such a manner as to form a short internal flap. The assistant having charge of the arm is then to remove it, and the axillary artery is to be secured immediately and the other vessels tied at once. When the left side is operated upon, the knife is entered under the lower margin of the posterior axilla and passed outward near the acromion. The outward flap is then formed and the

FIG. 120.



Making the first flap in Amputation at the Shoulder. Patient seated.

FIG. 121.



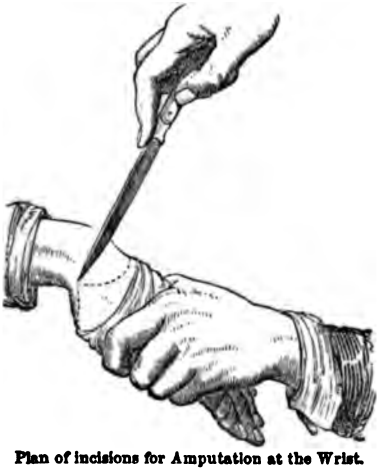
Making the second flap in Amputation at the Shoulder. Patient seated.

must be well cleared after the flap is formed and before the bone is sawed. Hemorrhage is to be anticipated by applying the tourniquet at the usual site.

Amputation at the Elbow Joint.—Amputation at this joint is seldom practiced, yet it may be performed with expertness and with safety to the patient, by forming a single flap in front of the arm and separating the integuments behind with a circular sweep. The arm is extended and disarticulation effected; or the olecranon may be sawn across, after which the flap is to be carried back so as to cover the condyle of the humerus and the wound treated in the ordinary manner.

Amputation of the Forearm.—Amputations in this part of the upper extremities are very frequently demanded. They should always be performed as near the wrist as possible; and the flap operation is generally preferable, although many surgeons prefer the circular method in these cases. The tourniquet is to be applied to the humeral artery and one flap is formed upon the dorsal and the other upon the palmar aspect of the arm. It is sometimes difficult to obtain sufficient material to make a good stump; therefore care must be taken to saw the bone as high up as may be convenient. These flaps may be formed by transfixion or by cutting from without inward. When the circular operation is performed, the first incision must be a light one and the integuments retracted as much as possible. The second incision is to be carried to the bone, after which the interosseous parts are to be cut away with a knife. In either case, the integuments may be retracted by a three-tailed piece of muslin and the bones then sawed through. The saw should operate upon both bones at the same time.

FIG. 124.

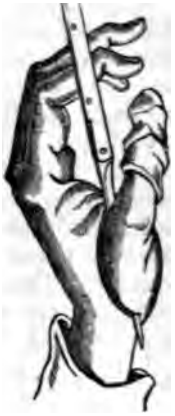


Plan of incisions for Amputation at the Wrist.

Amputation at the Wrist.—This operation is seldom performed; but when the surgeon considers its performance necessary, he may form his first flaps by retracting the integuments and then making a convex incision from one styloid process to the other across the back of the joint, the convexity of the incision looking forward. The hand is then to be flexed and disarticulation effected. The lateral ligaments having been then divided, the knife is carried forward and downward so as to make a good flap upon the palmar surface of the hand. The front flap is then to be brought backward and fastened in position by one or two sutures. A good sized bistoury is generally used in this operation, which requires to be performed with patience. Numerous small arteries require ligaturing.

Amputation of the Thumb.—When the phalanges of the thumb are to be removed, a firm bistoury may be used and two plain flaps formed by transfixion, one looking toward the dorsal and the other toward the palmar surface of the hand. The head of the metacarpus should be nipped off with the bone-pliers, when the two bones of the thumb are amputated. More commonly, however, the metacarpus also demands removal. To effect this, make an incision from the carpo-metacarpal articulation across the dorsal aspect of the hand to the commissure between the thumb and first finger; then transfix the ball of the thumb by passing the bistoury in at the commissure and out at a point opposite the first incision at the carpal articulation and form the flap by carrying the knife outward along the metacarpal bone. The thumb is then to be carried out and the disarticulation effected, when the flaps will come together snugly. If the left thumb is to be amputated, the incision from the web of the fingers to the carpo-metacarpal articulation may be taken first, afterward incising the dorsum and turning the bone out as before.

FIG. 125.



Dorsal incision in Amputating the Thumb.

Amputation of the Metacarpals.—When the metacarpus of the thumb is diseased and the phalanges are sound, the latter bones should be saved if possible. The metacarpus may be removed by making a free incision along the radial aspect of the bone and then disarticulating it from its connections above and below. The metacarpus of the little finger may be removed in much the same way, the skin over the part being first drawn toward the radial side of the hand. When any of the other metacarpals are to be amputated, they may be exposed by making a direct incision over them along the dorsal aspect of the hand, and this may be met by a cross incision opposite each articulating extremity. The metacarpus is then to be disjointed from its carpal and phalangeal articulations. The blood vessels should be avoided in these operations, and secured properly when their severance is rendered necessary.

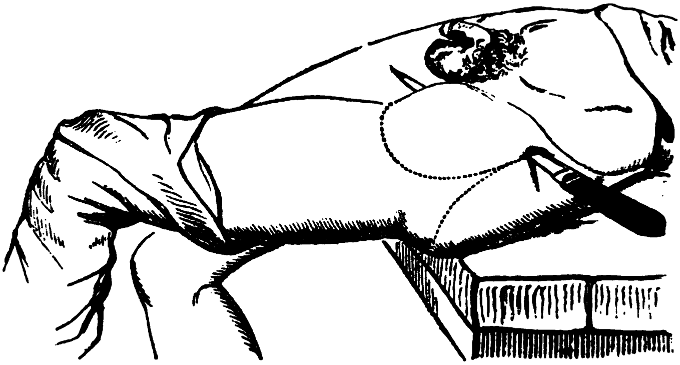
Amputation of the Phalanges.—The phalanges may be separated from one another by making a direct incision across the joint upon its dorsal aspect, then severing the lateral ligaments, carrying the knife through the joint and forming a flap upon the palmar surface of the finger. Or the anterior flap may be formed by transfixing the palmar aspect of the finger and then disarticulating the joint from before backward. In this latter mode of procedure, the incision must be formed far enough forward, otherwise too small a flap may be cut.

When the whole finger is to be removed, the surgeon may seat his patient, take the finger in his left hand (holding the dorsal aspect of the patient's hand upward) and then pass a bistoury up between the fingers, to the surgeon's left of the one that is to be removed. The incision may then begin over the phalangco-metacarpal articulation, carried down to the commissure of the fingers, across the palmar aspect of the phalanx and up through the other commissure, to the point from which it started. The finger is then to be bent downward, the ligaments severed and the tissues on the front of the phalanx cut away in form of a flap. Or the surgeon may proceed more deliberately by beginning an incision on each side of the phalangeo-metacarpal articulation, bringing each incision downward to the commissure between the fingers and causing them to meet on the palmar aspect of the hand, then disarticulating the joint and forming the flap as before. It is generally proper to extend a small incision upward over the metacarpus and remove the head of this bone. This obviates unpleasant deformity between the fingers after the edges of the wound have been brought together. Where the index finger is to be removed, the outer flap may be formed by cutting the tissues from without inward to meet the flap that is extended from the metacarpo-phalangeal articulation through the interdigital web. The digital arteries may be large enough, in all these cases, to require ligation; but hemorrhage is more often left to the spontaneous hemostatics of nature.

Amputations of the Lower Extremities.

Amputation at the Hip Joint.—The simplest mode of procedure, in this amputation, consists in making an anterior flap by transfixion and a posterior one after the joint is disarticulated. The patient having been laid upon a table, the body is brought outward upon it so that the nates shall project a little. One assistant then holds the sound limb and another rests the foot of the unsound one upon his knee, a third assistant makes compression on the femoral artery, as no tourniquet can be applied to this vessel. The patient having been then brought under the influence of chloroform and a catline knife of sufficient length held in readiness, the blade of the instrument (in the amputation upon the *left* side) may be entered just below the anterior superior spinous process, carried down close against the bone and pushed out on the opposite side of the limb above the tuberosity of the ischium.

FIG. 126.



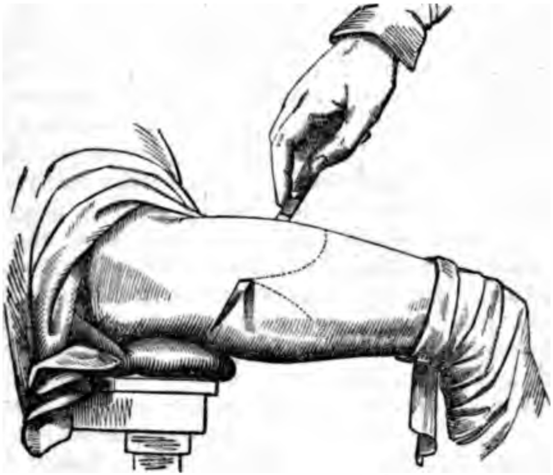
Plan of Amputation at the Hip Joint.

The flap is then to be formed by carrying the knife downward and forward. The assistant who is holding the limb should carry it outward and evert the toes, when the capsule of the joint may be cut into and the head of the bone rotated from its socket. The knife is then passed behind the femur and a posterior flap formed by carrying it downward and backward through the glutei muscles, bringing it out at the lower part of the nates. When the *right* side is operated upon, the anterior flap is formed by passing the knife in an opposite direction from that which has been advised for the operation on the left side, the capsule being severed and the posterior flap formed the same way.

The hemorrhage in amputation of this joint is very great; for with the best compression upon the artery in the groin, the vessel is but partially occluded. A successful termination of the procedure, therefore, very commonly turns upon the expertness with which the ligature is applied; and although it is not often advisable to be over hasty in any surgical operation, the utmost possible agility is here demanded. It is an excellent plan to have the assistant, who compresses the artery upon the pubes, seize the upper flap as soon as it is formed, grasping it firmly on both sides and thus compressing the artery while the posterior flap is being formed. Much steadiness and carefulness is required on the part of this assistant. After the artery has been duly secured, the flaps are to be dressed in the ordinary mode.

Amputation of the Thigh.—This operation may be performed at either the upper, middle or lower third of the bone, the lower third being preferable wherever circumstances admit of its performance. The flap operation is used in nearly all cases, the first flap being formed upon the anterior aspect of the limb and the other on the posterior aspect. Vermaile, however, preferred to make two lateral flaps. In either case, the flaps may be formed by transfixion; or, in the antero-posterior flaps, the first incision may be directed from without inward. When this operation is performed on the lower part of the thigh, excessive hemorrhage may be provided against by applying the tourniquet to the femoral artery. When the upper third of the thigh is operated upon, the vessel must be pressed upon the pubes by the fingers of an assistant, as in disarticulation of the hip joint. When the patient is greatly emaciated, nearly all the flap is to be formed on the posterior aspect of the bone. In very muscular patients, the skin alone may be transfixed with a knife, while the bone is reached by making circular incisions through the muscular structures.

FIG. 127.



Plan of flap Amputation of the Leg.

Amputation at the Knee.—It was formerly considered a necessarily fatal operation to remove the foreleg by incisions through the knee. Experience has proven, however, that this operation can be performed with perfect safety; and it is a mode of procedure sometimes preferable to amputation either of the femur or of the tibia and fibula. It may be performed by making a semi-circular incision from one condyle to the other, carrying the knife in front of the knee and under the lower edge of the patella. The limb being firmly extended, the ligaments are then to be severed and a flap formed upon the posterior part of the limb by carrying the knife through the joint and then backward and downward. This flap should be of sufficient size to come forward and cover the extremity of the femur, but not large enough to form a redundancy of integument in the cushion.

Amputation of the Leg.—Amputation of the leg, when a point of election is allowed the surgeon, should generally be performed at the lower third of the limb; when this is not possible, however, a distance of three inches below the articulation of the knee will be found a very favorable position. The flap amputation is preferable, though the circular amputation is a favorite mode of procedure with many surgeons. The anterior flap may be formed by cutting from without inward, when the knife is passed under the bone and through the limb and the posterior flap formed by cutting downward and backward. In applying the saw to the bones, it is best to sever the fibula first and then to cut through the tibia. Firm retraction should be made upon the flaps before the saw is applied, and it is necessary to get a good share of integument upon the posterior part of the leg in order that a suitable stump may be formed. Sometimes, however, in very muscular patients, too much integument is taken from the calf of the leg in the posterior flap; and this may interfere with the healing of the wound and even become a source of annoyance after the stump is cured. This contingency may be avoided by transfixing the skin only, both upon the anterior and posterior surfaces of the limb, and continuing the amputation by circular incisions.

Amputation at the Ankle.—Amputation at the ankle is now commonly performed, but very different opinions are entertained of the propriety of this procedure. The foot may be disarticulated by making a semi-circular incision from the external to the internal malleolus, the convexity looking downward. The ligaments are then severed and the knife passed down under the plantar surface, directly from one malleolus to the other, and the calcaneum then dissected out. The malleoli need to be sawn off in order to leave a smooth surface upon the bone, and any excess of tendo-achillis in the posterior flap should be removed. In dissecting the posterior flap, the knife should be kept close to the bone, as this avoids injuring the circulation of the part.

Amputation of the Tarsus.—The foot may be removed through the tarsus by forming a flap upon the dorsum with an incision extending from the projection of the scaphoid bone to the malleolus of the opposite side. This flap is dissected up and the joint opened between the calcaneum and cuboid and the astragulus and scaphoid bones; the foot is then pressed downward and the interosseous ligaments divided, the tarsal bones then thrown upward, the toes being pressed downward, the knife passed through the joint and a flap formed upon the plantar surface. The lower flap should be long, as there is a large surface to cover by it. The operation has been a favorite with French surgeons, but it is seldom practiced at the present time. It is objectionable from the fact that the tendo Achillis is liable to retract the lower part of the stump, thus causing the patient to walk upon the tender cicatrice. Nearly all surgeons at the present time prefer to remove the foot at the ankle, as above mentioned.

Amputation of the Metatarsal Bones.—The whole range of the metatarsal bones may be removed by incisions similàr to those above mentioned for amputation of the tarsus. A semicircular flap is formed upon the dorsum of the foot, beginning at the tarso-metatarsal articulation of the great toe and terminating at the same articulation of the little toe, the convexity of the flap being directed forward. The flap is then dissected up and the joints successively disarticulated by pressing downward upon the toes and severing their respective ligaments. It is not uncommon to meet with anchylosis at the second metatarsal bone, when a saw will be required to effect disjunction of the parts. The lower flap may then be formed by cutting from without inward upon the plantar surface of the foot, or by passing the knife downward through the severed joints and then carrying it forward and outward. This flap should always be of considerable size; the vessels are to be secured in the ordinary way and the flaps held in position by sutures and straps.

The *metatarsus of the great toe* frequently demands amputation on account of various forms of disease seated in it. The part is removed by commencing an incision upon the dorsum of the foot, over the tarsal articulation and at the inner edge of the metatarsal bone. This incision is then carried directly forward to a point opposite the metatarso-phalangeal articulation, when it is directed inward around the edge of the toe and then upon the plantar surface. Here it is carried backward, on a line opposite the incision on the dorsal surface, till it reaches the tarsal articulation. This flap is then dissected back and the bone exposed; the lateral ligaments are severed and the part removed. It sometimes happens that but a small portion of this bone is affected, when it is the surgeon's duty to cut it through with the pliers or saw, and save all those parts that are sound. The important connection of the peroneus longus muscle with this bone should be preserved whenever it is possible, as the foot is invariably weakened when the whole of this metatarsus has to be removed.

When the metatarsus of the little toe is to be amputated, an incision is to be commenced behind the tubercle of this bone, carried upon the dorsum of the foot along the line of the tarsal articulation and to the inner edge of the metatarsus. It is then carried downward in a line with the commissure of the little toe and the one adjoining it, then around the plantar surface and under the bone in such a manner as to make one oval flap. This flap is then to be dissected down upon the outside of the metatarsus, when the knife may be passed under the bone and made to meet the incision that terminated on the plantar surface near the interdigital web. The toe is then drawn firmly outward, the ligaments severed and the parts removed as before.

Amputation of the Phalanges.—The phalanges of the toes are to be amputated in the same manner as those of the hand, with the difference that the heads of the metatarsals of the foot should not be taken away.

CHAPTER IV.

RESECTION OF THE BONES.

General Remarks.

It is always desirable to save as much of a limb as possible; and when an operation is positively demanded, the judicious surgeon will endeavor to limit the use of his knife for the benefit of his patient rather than extend it for his own glorification. Resection, or excision of the bones, is one of those classes of operations which modern surgery has particularly introduced for the above purpose, the desire being to avert the contingency of amputation by removing that portion of the osseous structures which is alone affected. Gunshot wounds, comminuted fractures and the development of malignant tumors, are the conditions for which resections are especially practiced. The head of a bone may be excised, or a portion of its shaft may be cut away, or even the whole of the bone (as the maxillæ) may be removed. The extent of the operation is limited wholly by the nature and extent of the difficulty for which it is performed, and the same may be said of the particular mode of carrying on these procedures. Probably there is no class of operations that sets exact rules so much at naught, or presents the surgeon with such favorable opportunities for displaying his knowledge and his mechanical skill to advantage. Resections are always grave undertakings; yet expertness on the part of the operator, together with judicious preparation and after management of the patient, renders them so commonly successful that they have lately come very much in fashion. Nearly all the principal bones of the body have been thus operated upon, and scarcely a month passes but we hear of new and startling attempts in this line.

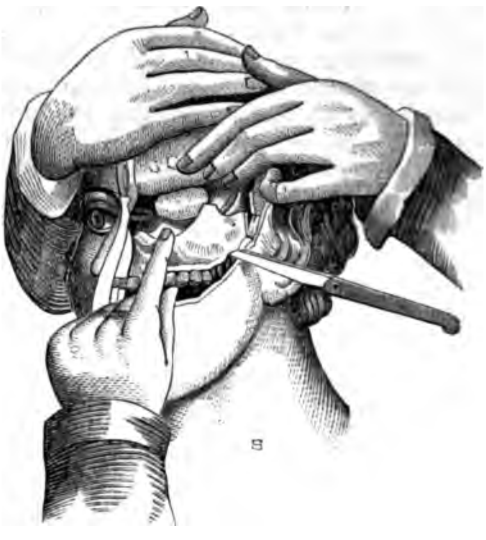
In practicing resection, the bone is to be exposed by a simple or compound incision, the integuments being cut in such a manner as to escape crossing the principal vessels of the part. The bone should be reached directly and the soft structures drawn to one side by suitable hooks, after which the severance of the part is to be effected. Chain or flat saws, chisels and gouges, may be required for this purpose and they should all be prepared convenient to the surgeon's hand before any operation of this class is undertaken. In removing a portion of the bone, it is of the first importance to excise every part of the tissue that is diseased, not a shred of degenerated osseous structure being left behind. In the excision of a joint, disarticulation of the head of the bone may be effected either before or after the shaft is severed. All the cartilaginous materials in the joint should be removed along with the bone and no loose shreds of tissue allowed to remain. The external wound is then to be brought together by adhesive straps or sutures; when, as in the case of an extremity, the lower fragment of the incised part may be brought up near the portion next above it and solid union favored or a false joint be formed.

These operations are generally delayed till the degeneration of structure that demands it has proceeded to a serious extent. It is preferable, in all cases, to decide upon resection at an early day, as the chances for success are at such times much better than when disorganization has advanced further. When several bones are complicated in the advance of any form of disease (as necrosis), resection always becomes more formidable, and proves a tedious operation when the soft parts become adherent to the bone and infiltrated with plastic effusions. The dangers following this operation are tetanus, exhaustive suppuration, phlebitis or general erysipelas, purulent absorption leading to pyæmia, and even gangrene. Aged persons should seldom be operated upon and the surgeon should avoid interfering with persons of a cachectic tendency.

Resection of the Bones of the Face.

Of the Superior Maxillary.—The superior maxillary may be removed in part, or entirely. When the alveolus alone is affected, it may be reached by raising the lip up, cutting away the gums from the bone and then excising the parts either with a gouge and mallet or by a small, flat saw. More commonly, however, a large portion of the jaw requires to be operated upon; for which purpose the patient is to be seated in a chair, his head thrown back and rested against an assistant's breast, the surgeon taking his position in front of him and commencing an incision a little below the internal canthus of the eye, extending it along the margin of the nose, continuing it downward externally to the ala and thence onward to the outer angle of the mouth. A second incision is then to be made from the angle of the mouth outward and upward with a gentle sweep, forming a curved line terminating opposite the external canthus of the eye, about midway between it and the lobe of the ear. A large triangular flap is thus formed, which is to be dissected from below

FIG. 128.



Resection of the Superior Maxillary. The osseous connections having been severed, the soft parts are about to be divided with the knife.—PANCOAST.

upward till it reaches the orbit, when it is to be carried upon the forehead and there held by the hand of the assistant. The bone is thus brought to view, when both the maxillary and malar bones may be severed from the zygomatic and frontal attachments by a few blows with the mallet and chisel and the connections with the nasal bones then divided. The soft parts connected with the ala of the nose are to be cut away, the incisor tooth extracted and the diseased maxillary separated from its fellow of the opposite side. After these operations have been effected, the connection between the maxillary and the floor of the orbit is divided by passing the chisel backward and from above downward. The connection with the pterygoid process is thus broken, the orbit and its contents being carefully preserved entire. The surgeon now seizes the bone with his left hand and proceeds to separate all the posterior connections of the soft parts with the knife, making his incisions commence from above and proceed downward. Any arteries that may be cut are to be secured at once by ligature, afterward the flap may be brought down to its place and secured by a few twisted sutures.

This is among the most formidable operations of surgery and one that is seldom performed except under the most urgent necessities. Not only has the maxilla to be removed, but the palatial bones and os unguis have to be more or less completely excised. When malignant tumors affect this part, however, no alternative is left to the surgeon but to operate at an early day, by which means life is not uncommonly saved. If the incisions through the integuments have been made smoothly and carefully, the cicatrices will not be unsightly. There is always more or less paralysis of the muscles of the face, but the external deformity is not particularly noticeable after the wounds have healed up.

Of the Inferior Maxillary.—When the chin alone is to be resected, two flaps may be formed by carrying an incision from the center of the lower lip downward over the symphisis and backward under the lower edge of the bone. Each flap is then to be dissected down carefully to the maxillary, the incisors are to be removed, the muscular insertions on the inner surface of the bone cut away, the tongue held backward by a wire thread inserted through the genio-hyoglossus and the bone then sawn through from the incisors downward and any other soft parts that are connected with it at once cut away. The flaps are then brought together and reparation of the part proceeds without much difficulty.

When one side of this bone is to be removed, an incision is to be carried downward from the canine tooth of that side to the base of the chin; and another incision is carried from the posterior part of the ramus of the jaw along the whole inferior edge of the maxilla till it meets the bottom of the first incision. The flap is then to be dissected from below upward and reflected upon the cheek. If the bone is to be removed at its angle only, it may be sawn through at the first molar tooth, the soft structures on the inside severed and the excision completed by sawing through near the symphisis. When the bone is to be removed quite up to its articulation, the second incision must be continued up in front of the lobe of the ear and the masseter and other muscles carefully divided; the rest of the operation is then completed as before, great care being taken to ligate the arteries in due season and to avoid doing injury to the parotid duct.

The entire lower jaw is sometimes resected. This operation may be performed by carrying a single incision from the lobule of one ear along the lower and posterior edge of the bone completely across to a point anterior to the lobule of the ear on the other side. This incision will divide the facial artery, which must be at once ligated. The large flap thus formed is dissected upward from the bone and reflected upon the nose and cheeks. The insertion of the platysma and mylo-hyoid muscles are then to be separated and an annealed wire passed through the genio-hyoglossus muscle, brought out between the lips and there held so that the tongue may not be convulsively retracted. The attachments upon the inner surface of the bone are then severed, the jaw is sawn through at its symphisis and each of its two portions then dissected away after the manner described in the last mentioned operation. During these operations upon both the lower and upper jaws, steady pressure should be made upon the carotid artery by an assistant, being discontinued only when the larger arteries that are severed in the operations have been secured. In removing the angle of the jaw in the last operation, the divided symphysis is to be carried outward during the severance of the connection of the soft parts with the coronoid process, the flap is then to be brought downward and maintained by sutures, the patient being afterward cared for with all the medical skill that the surgeon can command.

Resection of the Upper Extremities.

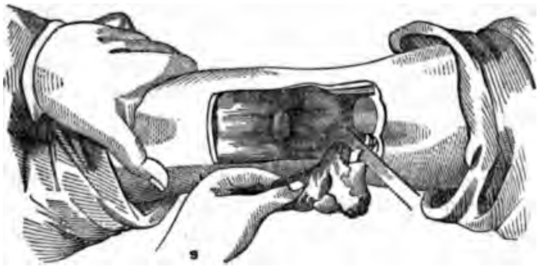
Of the Scapula.—The acromion or spine of the scapula may be removed by making a direct incision along its course, severing the muscular attachments to the bone and then removing the diseased parts with a saw. When the acromion is removed, its clavicular attachment may be separated and then its posterior portion sawn through, after which it is to be separated from its ligaments on its inferior border. A large portion of this bone may be removed and Mr. Syme has recently reported a case in which he performed this operation. We can not do better that quote his own words. The resection was undertaken in consequence of a large tumor upon the scapula: "An incision was made from the acromion process transversely to the posterior edge of the bone, and another from the center of the first directly downward below the lower margin of the tumor. The flaps thus formed were then reflected. The scapular attachments of the deltoid, and the connections of the acromial end of the clavicle, were next divided. With a view to prevent the most serious source of hemorrhage, the subscapular artery was next cut across and secured. The joint and circumference of the glenoid cavity were next divided; the finger being hooked under the corocoid process greatly facilitated the division of its attachments and enabled the operator to pull back the bone and separate its remaining attachments with rapid strokes of the knife. The limb was supported and retained in situ by a bandage. The tumor, on examination, was found to consist of a nearly uniform expansion of the bone into a bag, partly membranous, partly osseous, containing a cerebriform growth and extended to the margin of the glenoid cavity and spine of the bone. All seemed to promise well after the operation; the wound healed rapidly. At the end of a fortnight the amount of discharge was scarcely sufficient to stain the bandage. The shoulder assumed a very natural appearance and it seemed that by the support afforded by the clavicular portion of the deltoid, together with the action of the pectoralis and latissimus dorsi, the limb would be able to execute a fair degree of motion—indeed, the woman was with difficulty prevented using the limb too freely; but the patient's strength did not improve in a corresponding degree, and toward the end of November she suddenly sank, and died on the first day of December."

This is a very formidable operation and one which is, as yet, a novelty with the profession. It is quite probable, however, that it may yet be performed with entire success.

Of the Humerus.—The head of the humerus is resected more frequently, perhaps, than any other bone—this part of the skeleton being liable to many accidents, although not so frequently attacked with malignant growths as some other parts of the osseous system. Several modes of procedure finger as a director to the knife. The head of the bone is to be luxated by carrying the elbow inward and then forcing it upward. This enables the surgeon to pass the knife behind the bone, when the adhesions of the soft parts on its inner face may be divided. The soft parts may then be protected from the saw by passing a compress between them and the bone, after which the head of the humerus is to be cut off at that point which the necessities of different cases demand. The operation upon the head of the humerus is very commonly successful. The forearm may be supported in a sling after the wounds have been dressed; and a fair degree of motion is usually recovered in the parts—the muscles either becoming attached to the bone so firmly as to support its ordinary movements, or the sawn end of the humerus being shoved upward into the glenoid cavity, where a false articulation is formed.

At the Elbow.—The lower end of the humerus, or the humerus, radius and ulna, have all been excised at the point of their articulation. The most common mode of performing the operation is by forming two square flaps. To do this, the point of the bistoury is inserted perpendicularly into the tissues over the olecranon, with the back of the instrument looking toward the ulnar nerve. The knife is then carried completely across the back of the joint, dividing all the integuments down to the bone. Two other incisions are then extended, at right-angles with the extremities of the first one, to the distance of two or more inches up and down the internal and external aspects of the arm. Where the end of the humerus alone is to be resected, the lateral incisions need not be extended below the first incision, as one flap only is required to be raised. The incisions having been made, the flap or flaps are to be dissected back, care being taken to avoid the ulnar nerve. Having exposed the bone and pushed the ulnar nerve to one side, the radius may be twisted forward and the forearm bent, when the external condyle will be brought to view and may be excised with the saw. The

FIG. 130.



Resection of the extremity of the Humerus, the operation nearly completed. The engraving does not show the reflected flaps to good advantage.

olecranon may then be sawn through and the disarticula completed by passing a bistoury into the joint, severing ligaments and loosening the attachments on the ant aspect of the condyles. When the bones of the forearm also implicated in the difficulty for which the resectio undertaken, they are to be sawn off first; after which attachments on the anterior aspect of the bones may loosened, the forearm flexed, the humerus extruded thro the opening and then severed above its condyles. This op tion has been practiced with a fair degree of success, tho it is a formidable one. In performing it, the patient sh be laid upon his face and the arm held outward from body by an assistant. After the bones have been excised, forearm is to be held in a position midway between pronat and supination and the elbow may be fixed in a semi-fle position by splints, so as to give the greatest possible use ness to the forearm in case anchylosis should take place.

Of the Radius.—The whole radius has been removed, o few occasions, by extending an incision from the exter tuberosity of the humerus along the outer edge of the rad in the course of the supinator longus and quite to the exter styloid process. The supinator brevis is to be cut thro and all the other soft structures severed. An incision be extended across the back of the wrist, meeting the lo extremity of the first incision at right-angles. The mus having been then detached, the bone may be removed enti or it may be sawn through its middle, each fragment car outward, the interosseous connection severed and disarticu tion completed in the ordinary way.

At the Wrist.—The lower extremities of the radius a ulna are seldom operated upon, the numerous tendonous c nections of these parts and the liability to extensive suppu tion being sufficient to contra-indicate the operation in nea all cases. In a few rare cases, however, especially in rece and extensive injuries to these parts, excision may be succe fully employed. The palm of the hand is laid upon the ta and an incision extended from the external styloid proc up the border of the radius about an inch and a half. similar incision may be then made from the internal stylo process and the two united by a direct incision across t back of the carpus. The square flap thus formed is dissect backward and the tissues upon the anterior aspect of t forearm are loosened from the bones and held downward passing a slip of muslin through the opening. A chain sa is then introduced above this compress and below the bon which are severed from below upward; disarticulation is th proceeded with in the ordinary way. When the lower end of the radius only is to be operated upon, the incision upon the internal aspect of the arm need not be made, but a triangular flap formed by an incision on the external border of the radius met at right-angles by an incision across the back of the wrist. The same general mode of procedure is pursued when the extremity of the ulna is to be removed. The motions are necessarily lost to a great extent in the three last operations.

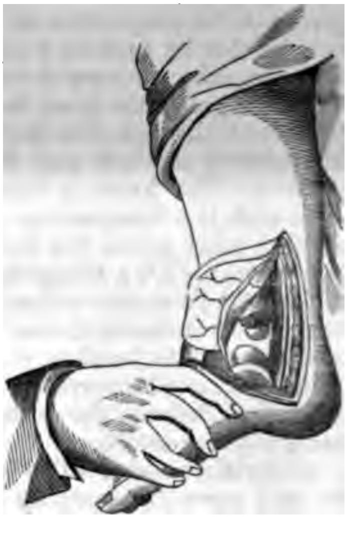
Resection of the Lower Extremities.

Of the Head of the Femur.—This very formidable operation has been undertaken in only a few instances and then with very poor success. Where it is practiced for caries of the joint, little good can be hoped for, as the acetabulum is almost invariably implicated in the destruction and the patient is not very likely to recover from the shock of the operation. When, however, the upper extremity of this bone has been injured by gunshot wounds, resection is sometimes decidedly preferable to amputation at this joint. The joint may be exposed either by making a semi-circular incision from the anterior superior process of the ilium backward and downward to a point below the great trochanter. The glutei muscles are to be cut through, the flap raised upward, the thigh flexed and carried inward and the capsule and round ligament divided. The knife is then passed under the head of the bone and the ligamentous connections on its anterior aspect divided, after which the bone may be sawn off at an appropriate place. Or a triangular flap may be formed by making an incision from two inches below the anterior superior spinous process downward over the great trochanter. The upper extreme of this incision is met by another four inches long which is carried downward and backward. The flap having been dissected up, the bone is exposed and resected in the same manner as above.

At the Knee Joint.—The lower extremity of the femur may be laid open by carrying two longitudinal incisions from below the condyles upward along the edges of the bone to a distance of about three inches. A transverse incision is then carried across in front of the joint and just below the patella, uniting the lower extremities of the two lateral incisions. The flap is to be dissected up, all the ligaments and fascia being severed. The knife is then passed into the joint and along the posterior surface of the femur, loosening the structures without injuring the popliteal vessels. The head of the bone is next turned out, when the soft parts in the ham may be protected by passing a compress over them and the lower portion of the femur sawn off. Some operators have advised to remove the patella along with the femur, but this should not be practiced unless both bones are diseased. When the tibia is affected in connection with the femur, the two lateral incisions are to be carried below the joint and a lower flap dissected backward, after the manner already directed for resection at the elbow. This operation upon these parts is a rather formidable one and is not in much repute with surgeons. It is likely, however, that it may be practiced with some success in those cases that are otherwise irremediable. Anchylosis of the parts is likely to take place as union is effected, hence the limb should be supported in a nearly extended position.

At the Ankle Joint.—In operating at the ankle, two lateral incisions are to be made, extending respectively from the internal and external malleoli upward to the distance of about three inches. The lower extremities of these incisions may be connected by a transverse incision; or a small rectangular incision may be made from the lower extremity of each of the lateral ones, extending forward to the distance of about half an inch. By this latter process, two triangular flaps are formed, which are to be turned over the front of the leg, care being taken to save the blood vessels and nerves and not to injure the muscles or tendons that extend from the upper part of the limb to the foot. Two compresses are then to be passed between the bones and the soft parts in order to protect the latter, when the chain saw may be introduced under the bones and the severance of the osseous structures completed. By then pressing the lower fragments of the bone forward, the connecting ligaments between them and the astragulus may be severed, after which the fragments are to be pushed outward to one side and the disarticulation completed. This operation, like that at the knee, is not often

Fig. 131.



Resection at the Ankle. Appearance of the parts after the fragments have been removed.

undertaken, but may be entirely successful and is decidedly advisable in recent extensive injuries. It always leads to shortening of the limb and the joint is necessarily weakened; but firmness of the part may be ultimately obtained in consequence of an anchylosed union of the fore-leg with the tarsus.

CHAPTER V.

PLASTIC OPERATIONS.

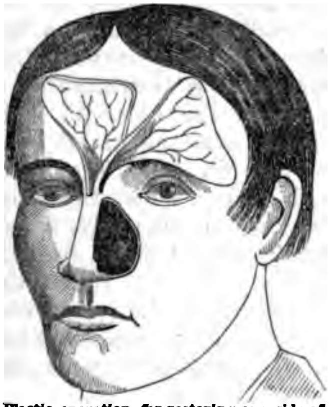
Plastic operations are performed for the purpose of restoring tissues that have been lost, by transferring sound tissues from a neighboring part to the site of the abrasion. They have also been performed for the purpose of relieving the deformities consequent upon extensive burns near any of the angles of the body. The face is the part upon which these attempts are most commonly practiced, the nose having long been a favorite site upon which to transplant sound integuments. The lids of the edge and various portions of the mouth have also called for operations of this kind; while extensive cicatrization in the neck, as also in the groin, frequently demands relief in this way. The operation upon the nose is the oldest, as well as the most commonly practiced, and may be taken as typical of the whole series of replacements.

In plastic surgery, the operator has first to consider the part from which he will derive the new covering for the opening which he is about to repair. As a general rule, this site should be as near the abrasion as possible. Thus, for the upper part of the nose the flap is usually derived from the forehead, while at the lower part of the nose, and in the lips, the integument of the cheek is used for the reparative purpose. The surgeon must always consider the amount of strain likely to be exerted upon the flap after it is fastened into the position to which it is carried. Thus, when the whole of one side of the nose is replaced by integuments taken from the cheek, the stress may be so great as to retard the flow in the part; and the attempt will fail in consequence of sloughing of the flap or the part will heal with an unsightly cicatrice because of the gaping of the edges of the wound around the points of the suture. The next point to be considered in this process is that of the shape of the flap. This is to be determined by cutting a piece of slender pasteboard so as exactly to fit the abrasion that is about to be repaired. Having thus formed an accurate idea of how much integument is needed, the surgeon is to lay his model upon the part from which he is about to take the flap and trace its outline with India ink or any other suitable substance. The position in which this model is laid is another point to be considered, but this must be determined by the position of the different parts operated upon. It is always advisable to leave as broad a peduncle as possible to the base of the integuments that are raised up, and to fashion it in such a form that it can be twisted or brought into position with the least possible strain upon the arteries coursing through that peduncle. In marking out the model of the parts to be raised up, a margin about one-third greater than the actual amount of tissue required must be left; for after the flap has been brought into position, there is always about this amount of shrinkage in it. When the flap is taken from the forehead, a clean incision is carried around the edges which have been marked out for it, and the whole is dissected up from the periosteum as cleanly as possible and with as little bruising and severance of blood vessels as may be. When the cheeks or any other supra-muscular portion of the surface is the site from which the flap is transplanted, the dissection is to be carried down entirely through the true skin, without including the fibrous structure. After the flap has been thus formed and raised up, it is to be carried to the position for which it is intended. The edges of the part which is about to be repaired having been denuded before the operation was commenced, the raw edges of the flap are brought into position with these raw edges, and the whole then secured by interrupted or twisted sutures. The adjustment of the parts to each other must necessarily be very close, otherwise no natural union between them can take place and adhesions cannot be formed. The site from which the flap was taken is to be drawn together and closed up by suitable sutures before the flap is brought to the position for which it was designed.

The success of all plastic operations depends very materially upon the close adjustment of the flap to the edges of the part for which it was intended, and then upon leaving the base of the transplanted portion of integument sufficiently loose to allow free circulation through it. The flap necessarily becomes less active in its circulation than is natural, and there may be coldness and paleness in it for one or two weeks after the operation. This, however, must not be taken as an evidence that sloughing is about to commence, for it usually requires from six to eight weeks for the completion of the union between the parts. This field of operative procedure is a very wide one and, like that of resection, much depends upon the mechanical ingenuity of the surgeon. There is such an endless diversity of temperaments, conditions and shape of the parts to be supplied, conditions of the parts from which the integuments may be taken, etc., that nothing but general rules can be given to direct the operator, whose ingenuity may be displayed to any desirable extent in manipulations of this kind.

In plastic operations upon the nose (*Rhinoplasty*), the flap is generally taken from the forehead, especially when the upper part of the nose is to be repaired. One side of the nose, however, may derive its covering from the forehead and most operators prefer to repair every point on this part of the face by flaps thus derived. When a whole nose is to be made, it may sometimes happen that the forehead is too low to admit of a sufficient amount of integument to be removed between the base of the nose and the hair. When such a case is met with, the whole of the integuments may be derived from one cheek; or one-half of them may be derived from each cheek and the parts made to meet along the center of the organs. When the flap is derived from the forehead, its base at the root of the nose should be from a half to five-eighths of an inch broad. In marking out the form of the integument to be removed, the regular allowance of one-third should be made for shrinkage. The flap having been dissected up from the periosteum, it is to be twisted on itself and brought down into position. After union has taken place (which is generally at the end of the sixth week), the peduncle of the flap may be severed by passing a slender bistoury under it. The severance should be formed either in the shape of a semi-circle or a triangle, and a notch made in the integuments to receive it snugly. Before the flap is fastened to the nose, it must be remembered that the open space in the tissues of the forehead from which it was taken is to be closed up by passing a few sutures from side to side of the edges of the wound and making gentle traction upon them. The tissues of this part are usually ready to yield, and, by keeping the surface occluded from the air with a compress, a small cicatrix only will be left and no

FIG. 132.



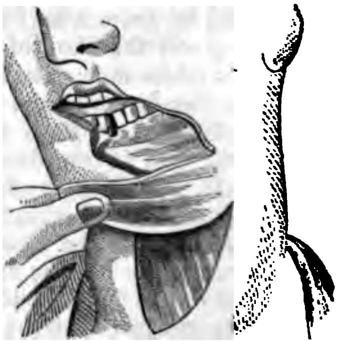
Plastic operation for restoring one side of the Nose.

unsightliness remain after the operation has been completed.

When the lower portion of the face is to be remedied, and the flap is taken from one side of the cheek, the position in which the integuments are removed should generally be horizontal with the center of the abrasion to be repaired. It may sometimes be advisable, however, to raise the flap at an angle with the abrasion, as this will allow the structures to be transplanted from one part to the other without twisting them so much upon themselves. The wound in the cheek having been then brought together by sutures, the flap is to be adjusted to its new position, the edges of the opening having been previously denuded for its reception.

Plastic operations are very frequently demanded for the restoration of one or both of the eyelids, deformity having been caused by ulceration of these parts, or by cicatrization following upon burns. The integument thus transplanted is taken from the side of the temple, when the upper lid is to be repaired; and from the cheek, along over the malar bone and downward toward the angle of the jaw, when the lower lid is operated upon. Sometimes, however, when the front part of the lower lid demands reparation in this way, a flap of integument may be raised outwardly toward the zygomatic arch and slipped forward to its new position. When the deformity has been the result of cicatrization, the scar is first to be dissected out with the scalpel, the conjunctiva being left untouched. The lids having been then drawn together, the surgeon is able to prepare his model and thus form an estimate of the amount of tissue that is required to repair the injury. These operations are very frequently successful, leaving but little deformity.

FIG. 133.



Plastic operation on the lower Lip.

When the lips are to be repaired, the integument is generally taken from the cheek for the upper lip, and from the neck for the lower lip. The surgeon is here at liberty to form his flap at almost any desirable angle with the abrasion, and is fortunate in being able to raise it so nearly parallel with the part to be repaired that it can be slipped over into position without having to be much turned upon itself. The pedicle of the flap should usually be broad and the parts from which it is taken are to be brought together as before. Very hideous deformities of the lips can be relieved in this way, and plastic operations at this point are seldom unsuccessful.

The deformities about the neck which are caused by cicatrization after extensive burns, are among the most unsightly accidents that occur to the human body. Generally speaking, the patient prefers to suffer them in silence; but plastic surgery can be here brought in to great advantage, generally affording complete relief to the unseemly appearance of these scars. The first step in these operations consists in removing the cicatrices, cutting down to the fibrous structure of the part. The head having been then brought to its proper position, the surgeon forms his model and proceeds to mark out the form of the flap along the outer side of the neck and down upon the shoulder. Sufficient allowance having been made, not only for the ordinary shrinkage of the parts, but for the angle that must be formed for the jaw, the flap is raised up and carried into position and the rest of the operation completed as before. In cicatrization at the angles of the thighs, either between the thighs themselves or about the scrotum and the other parts, plastic surgery may also be employed to advantage, the flaps being derived from across the anterior part of the leg.

CHAPTER VI.

OPERATIONS UPON THE UTERUS AND ITS APPENDAGES.

Cæsarean Section.

In the days of barbaric midwifery, before the enduring powers of the system were known or the sanative influence of nature's remedies was understood, section of the uterus was not an unfrequent practice in cases of difficult labor. Of late years it has been quite excluded from the operations of surgery and has even been omitted from mention in some of the modern works on midwifery. This is judicious; for while a Cæsar was given to the world in this way, the advances of medical and chirugical science have rendered this operation almost entirely unnecessary. It of course compromises the life of the mother in every instance, and the existence of the child is seldom secured under this mode of delivery. There may be a few cases, however, where the operation is

required as the last slight hope of saving life. These consi
erations, therefore, have induced us to give a place to Cæsare
operations in this volume.

Before this operation is performed, the heat of the roc
should be raised to a temperature between seventy and eigh
degrees of Fahrenheit. The patient having been then la
upon a table and the abdomen exposed, a direct incision
made from the umbilicus to the symphisis, in the mesial lin
The skin and cellular tissue having been cut through, t
layers of integument that intervene between the uterus a
the surface are to be incised in order. The uterus havi
been reached, it is to be opened by an incision upon its anteri
aspect, the upper extremity beginning from two to four inch
below the fundus. The opening in this organ having be
made sufficiently wide to allow the child to be extracted, t
funis should be tied and severed and then returned to t
organ, the secundines not being taken away rashly lest pr
fuse hemorrhage be induced and the life of the patient th
still further jeoparded. The wound in the uterus is th
brought together and may be retained by a couple of suture
although it has sometimes been left to the adhesive efforts
nature. The blood in the abdomen having been then absorbe
by sponges, the wound in the superficial tissues is to b
brought together, the patient put quietly to bed and the aft
health watched with all possible anxiety. If the patient
restless and sleepless, she must be put upon a free use
lobelia and boneset pills; drinks of mentha or asarum ma
also be given, and asclepias and lobelia administered freely i
the pulse becomes large and hard. If there is fainting, wit
a tremulous pulse, diluted third preparation of lobelia ma
be given in small and frequent doses; or serpentaria, capsicum
or zinziber and capsicum, used for the same purpose. If th
secundines come away and there is hemorrhage from the uterus
capsicum and myrica should be given by infusion in larg
quantities, the hands and feet being at the same time bathe
in warm water to which some suitable stimulant has bee
added. Systemic excitement may begin almost immediatel
after the performance of the operation, or it may be delaye
for two or more days. The wound itself is to be treated ac
cording to its condition.

Ovariotomy.

Fibrous and encysted tumors of the ovaries seem to be mor
common at the present time than ever before, at least w
hear more about them, and the practice of ovariotomy i

among the more fashionable operations of the day. It is among the capital undertakings of surgery and the propriety of its frequent performance has been repeatedly called in question. Statistics have proven, however, that even under the regime of Allopathy, ovariotomy offers the patient a fair prospect for her life; while the tumor, if left alone, allows but a small chance for the long continuance of her existence. Under the sanative influence of Physio-Medical management, judiciously carried out both before and after the performance of this operation, the chances for the patient's life are much increased. Dr. Walter Burnham, of Lowell, Mass., has operated twenty-five times in cases of this kind and has lost, if we are correctly informed, but five patients out of the whole number. Dr. Stotesbury, of Georgia, recently operated in a case, and not only had no unpleasant sequences to the procedure, but the patient gave birth to a hearty child within seven months after the operation, thus showing that pregnancy existed at the time of its performance. Such results as these certainly encourage us in the belief that this operation may yet come to be one of the most successful of surgery, endangering the patient's life to but a moderate degree while it saves her from the certain death that awaits the unchecked development of ovarian tumors.

In performing ovariotomy, the patient is to be laid on her back upon a firm table, the nates resting against one end of the board while the feet hang a little down and the abdomen is fully exposed. The surgeon may take his position at one side, or between the patient's limbs, and commence his duties by making an incision through the mesial line, extending it from the umbilicus to the symphisis, or even opening the tissues from the ensiform cartilage to the pubes. The tumor is thus reached directly, when it is to be examined carefully and the extent of its adhesions traced. The dissection of these adhesions is then to be commenced and proceeded with till the entire growth is extirpated. The amount thus required to be removed will of course be different in different cases; and no definite rules can be laid down touching the course that the operator is to pursue in this respect. The whole growth is to be removed, after which the cavity is to be cleansed out, the parts brought into position, the patient put to bed and then cared for in the same manner that has been directed for the after treatment in the *Cæsarean Section.*

It may here be remarked that a majority of ovarian tumors are cysts, and not purely fibrous growths. The walls of these cysts may be quite thin, when it may not be necessary to remove the whole of the enlargement. A simple incision may be made through the linea alba and the cyst exposed and tapped, the whole of its contents being drawn off. Or this may be done through the somewhat extended wound in the abdomen and then the walls of the growth excised as if the fluid contents of the tumor had not been discharged. When the cyst is multilocular, the trocar and canula will need to be introduced to each department. Recently, the surgeons of Europe have advised to tap these cysts without proceeding to ovariotomy. Prof. Simpson, of Edinburg, makes but a small opening in the abdomen, introduces the trocar and canula and withdraws the fluid slowly and then closes the external wound. The bulk of the cyst is then squeezed each day and some of the fluid forced out of the tumor through the aperture in its walls and into the cavity of the peritoneum. This keeps the wound in the cyst open; and by then favoring the general health, supporting the system with tonics and purifying it with alterants, the absorption of the fluid may be ultimately accomplished. This procedure meets with much favor at the present time.

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